Developments in Roman glass vessels in Italy, France, Britain and the Lower Rhineland - c.A.D.40 - A.D.110

Cottam, Sally Elizabeth

Awarding institution:
King's College London

Developments in Roman Glass Vessels in Italy, France, Britain and the Lower Rhineland

c.A.D.40 - A.D.110

Sally Elizabeth Cottam

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Abstract

This thesis focuses on Roman glass vessels from the mid-1st century A.D to the late 1st and very early 2nd century A.D., specifically c.A.D.40-110. These years have long been identified as representing a significant episode in the story of ancient glass and witness a particularly remarkable period of change in glass vessel production across the Roman world. The purpose of this thesis is to further our understanding of what these changes are, when they occurred and the causes behind them. The first chapter presents the background to the research and demonstrates how the thesis relates to previous work in this field. The following three chapters focus on identifying those aspects of glass vessels that changed during this period and establishing a firmer chronological framework for these developments than has previously been possible. This is achieved by the analysis of carefully selected, closely dated glass assemblages from Britain, France, the lower Rhineland and Italy. The rationale behind the choice of sites is explained and factors influencing dating and quantification are discussed. Glass vessels from the selected sites are examined in detail in Chapter 4 and information relating to changes in form, colour and decoration are analysed and discussed in chapters 5 and 6. The implications of these findings are then assessed in the context of the development of the early imperial glass industry, particularly in relation to raw glass manufacture, scales of production, relationships between glassworkers and their materials, and the impact of glass working techniques on vessel form and finishing. The final chapter discusses wider factors in the Roman world that might have played an influential role in the manufacture and consumption of glass during this period, such as patterns of production and trade, political and military events and trends in other categories of decorative media and proposes new approaches to understanding glass development during this period.

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Keith William Cottam
1928-2011

Sebastian Keith Cottam
1964-2018

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Chapter One

Introduction to the Aims and Structure of the Thesis

1.1 Early Imperial Glass: A Roman Industrial Revolution

1.1.1 Introduction

Of all the materials to survive from the ancient world, glass is arguably the most capable of expressing the practical and aesthetic requirements of its anonymous producers and consumers. More flexible than ceramics or metalwork, its plastic qualities allow it to be shaped into countless forms. Even the simplest tablewares are testimony to a multitude of techniques available to manipulate shape and decoration. The inflated glass bubble can be worked whilst hot by the glassmaker using an assortment of tools and moulds. The plasticity of hot glass allows it to be pinched, twisted and pulled to create decorative ribs and points, and when cold the surface of the vessel can be intricately cut. The addition of minerals to the basic blue/green glass mixture gave the ancient glassmaker a full palette of colours to exploit.

The relatively high survival rate of Roman glass on archaeological sites, though curtailed to some extent by the process of recycling, has generated a very large body of data over the last century or more of organised excavation. Systematic research into dated glass groups has provided a number of typologies and overviews of the range of glass vessel forms produced through the Roman period (Morin-Jean 1913; Isings 1957; Goethert-Polaschek 1977; Rütti 1991; Cool and Price 1995; Price and Cottam 1998). These studies illustrate the considerable changes in manufacturing techniques, colour, form and decoration that occur from the late 1st century B.C. when Roman glass began to be produced in significant quantity, through to the 4th century A.D. and beyond.

Within this timeframe, certain periods have been identified during which glass vessel forms underwent particularly rapid transformation. This thesis focuses on the decades from the mid-1st century A.D to the late 1st/very early 2nd century, specifically c.A.D.40-110. These years witness a particularly remarkable phase of radical innovation in glass production across the Roman world and have long been identified as representing a

significant episode in the story of ancient glass (see below). The purpose of this thesis is three-fold. The first task is to identify those aspects of glass vessels that changed during this period and to place these changes within a chronological framework that is as precise as possible. This will be achieved by examining closely-dated glass assemblages drawn from Britain, France, the lower Rhineland and Italy. The information from these sites will then be analysed and trends in three key aspects in the appearance of glass vessels (form, decoration and colour) will be plotted. Armed with this data, the next step will be to seek answers as to why glass vessels changed so significantly during this period. The findings will be interpreted in the context of the development of the early imperial glass industry and its place within the wider Roman economy. The thesis will also touch upon the impact of other factors such as decorative trends in other materials and political and military events in the Roman world. An original approach to understanding glass development during this period will be proposed, paying particular attention to changes in the quantities of raw glass being produced and the relationships between the various agents involved in the chain of supply of glass across the empire. Before setting out in more detail the means by which these questions will be answered (Chapter 1.4), it is important to review previous observations concerning the changes in glassware during this period and identify features that might repay closer examination.

1.1.2 The choice of the study period

In Italy and the western provinces, the geographical focus of this thesis, several commentators have recognized how profoundly glass changes in the 1st and early 2nd centuries A.D., but no comprehensive typological and chronological analysis of the phenomenon has yet been undertaken. Looking at glass in south eastern France from the late 1st to mid-2nd century A.D., Foy and Nenna note a change in taste after the Flavian period, stating that from this point on 'un changement de goût est notable dans l'ensemble de l'Empire, comme on le sait, avec l'abandon des verres de couleurs vives et l'introduction d'une matière incolore' (Foy and Nenna 2003, 290). Grose, taking a slightly earlier timeframe, also pointed out the extent to which the industry developed in the 1st century A.D. In his discussion of the glass from Cosa on the Mediterranean coast of western Italy, he observed a number of particularly rapid changes, stating that 'with little exaggeration it can be said that the years spanning the reigns of Augustus through

Vespasian marked a period of a swift, even revolutionary, transformation of the glass industry' (Grose 1974, 31).

In his study of the glass from the fort of Vindonissa in Switzerland, Berger noted a number of differences between the glass vessels recovered from different areas of the site. Material from the pits in the camp itself and from the eastern part of the large 'Schutthügel' dump, dated to the pre-Flavian period, tended to differ from the later Flavian rubbish dumps forming the western 'Schutthügel'. The earlier areas produced more non-blown bowls, a higher incidence of polychrome vessels, and fewer colourless tablewares (Berger 1960, 6, 10-11).

For Roman Britain, a moment of particular significance in the story of glass production has been noted in the later 1st century A.D. Allen commented that 'during the last thirty years of the first century A.D. there was a marked change of style in popular glassware', citing the decline of strongly coloured glass, the increased popularity of colourless glass, and changes in the decoration of glass vessels (Allen 1998, 28). In his report on the Claudian/Neronian glass assemblage from Camulodunum, Donald Harden noted 'a certain change in the current glass fabrics' around the mid-1st century A.D. as polychrome and fine monochrome tablewares became much less common (Harden 1947, 291). These observations are developed by Donald Harden and Jennifer Price in their analysis of the mid-late 1st century A.D. glass from the palace at Fishbourne, by the cross-comparison of material from Fishbourne, Camulodunum and the legionary fortress of Vindonissa in Switzerland. They highlighted key groups of decorated tablewares which, though present at Camulodunum are rare or absent at Fishbourne and in the process of disappearing in the third quarter of the 1st century at Vindonissa. It seemed to be the case that 'all the main varieties of glass found at Camulodunum, other than plain wares ... had faded out, or were fading out, by c.75' and they concluded that it is reasonable to 'accept the evidence we have cited from these three key sites as clear proof that round about A.D.65-75 a rapid change took place in the fashionable varieties of fine glassware' (Harden and Price 1971, 322).

Changes in style and decoration apart, there are also clear indications that there is a surge in the availability of glass during this period, allied with a significant diversification in the forms being produced. In his major study of the glass of Augst and Kaiseraugst, Beat

Rütti noted that contexts dating to the second half of the 1st century A.D. produced the greatest variety of forms and the largest number of surviving finds of any period of similar or even wider timespan in the entire lifetime of the settlement (Rütti 1991, 19 Abb.3 & Tab.1, 69-70 Tab.8). Concurrently, glass production appears to have become a more widespread activity, with new provincial workshops identified in Gaul, Britain, Spain and Germany and the frontier regions (Foy and Sennequier 1991; Foy and Nenna 2001, 40-6; Price 2002 and 2005a; Da Cruz in prep; Follmann-Schulz 1991; Isings 1980). The following section takes a closer look at some of the main differences between a large assemblage from the early-mid 1st century and one from the very end of the 1st-early 2nd century A.D. From this direct comparison, it will be possible to clarify and isolate some of the trends in glass production that merit closer chronological refinement in the intervening period.

1.2 From Fréjus to Nijmegen: Half a Century of Change

One of the principal aims of this thesis is to establish a more precise chronology for what has, until now, been a widely recognised, but only loosely dated series of developments. Before this is undertaken, it is important to establish some of the general characteristics in glass form and decoration being described here. An informative illustration can be provided by the juxtaposition of two large assemblages from either end of the period to be analysed (c.A.D.40-110). Two groups of glass from Fréjus and Nijmegen are large enough to be representative of the types of glass in use, in the first case in the Augustan-Claudian period and in the second at the turn of the 1st/2nd century A.D. Other aspects of the sites justify a direct comparison; both are military sites, housing elite units and well-embedded in the military supply network. Both have been professionally excavated and published. An analysis of the glass assemblages, separated by only 50 years, provides a key list of the changes to be monitored in the remainder of the thesis.

The Villeneuve district in Fréjus (Forum Julii), on the French Mediterranean coast, excavated between 1976 and 1981 in advance of construction work, is believed to lie within a military camp connected with the Imperial fleet (Goudineau and Brentchaloff, 2009). Abandonment of parts of the site began at around A.D.40-50 and the area appears to have gone out of use entirely by the end of the Neronian period. The large group of

glass from the excavations (over 4000 fragments) dates almost exclusively to the early-mid1st century (Cottam and Price 2009).

The glass from the eastern *canabae legionis*, adjacent to the later 1st century legionary fortress at Nijmegen beside the Waal in the eastern Netherlands, comes from a series of pits thought to have been filled-in towards the end of the 1st century A.D. Just under 2500 fragments of glass, mainly from vessels, were recovered (Isings 1980). The excavators considered that the Nijmegen glass assemblage, which included evidence for manufacture, might have been a collection brought together as cullet, for the purposes of re-melting and re-use at a nearby glass workshop (Isings 1980, 281).

Site	Fréjus	Nijmegen
Manufacture (excluding bottles)		
Non-blown	1048	110
Mould blown	14	26 +
Blown	3083	c.2070
Colour		
Polychrome	306	7
Strongly coloured	1473	15
Colourless	0	33
Vessel form		
Cups, bowls and plates	1173	458+
Jugs/jars	28+	88
Jars	10+	64
Unguentaria	158	32
Bottles	5+	158
Decoration		
Tooled ribs	11	33
Facet and relief cutting	0	4
Indents	1	c.85
Applied self-coloured trails	2	c.30

Table 1.1 Nijmegen and Fréjus, estimated quantities of individual colours, forms and decorative techniques

Table 1.1 summarises the glass from these two assemblages, grouping the fragments by method of manufacture, colour, form and decoration based upon the published data. Whilst there may be differences in the methodologies used for the quantification of fragments and in the descriptions of colour and form, the general impression of the assemblages given in Table 1 corresponds with other contemporary groups and provides a fair reflection of the sorts of vessels in circulation in the early-mid-1st century A.D. (Fréjus) and at very end of the 1st/beginning of the 2nd century (Nijmegen).

The most striking visual difference between these two groups of glass lies in the range and quantity of colours used in the manufacture of the vessel glass and the ways in which those colours are used. First, a simple count of the number of colours in each group is revealing. Figures 1.1 a and b show the number of different glass colours found in each assemblage, together with an indication of their relative frequency. Vessels made in the natural blue/green range of colours are the most common at both sites, as is the case throughout the 1st century A.D. and beyond. Nevertheless, nearly half of the Fréjus assemblage is made up of deliberately coloured glass, both polychrome and monochrome. In stark contrast, blue/green glass fragments formed about 97% of the glass assemblage from Nijmegen.

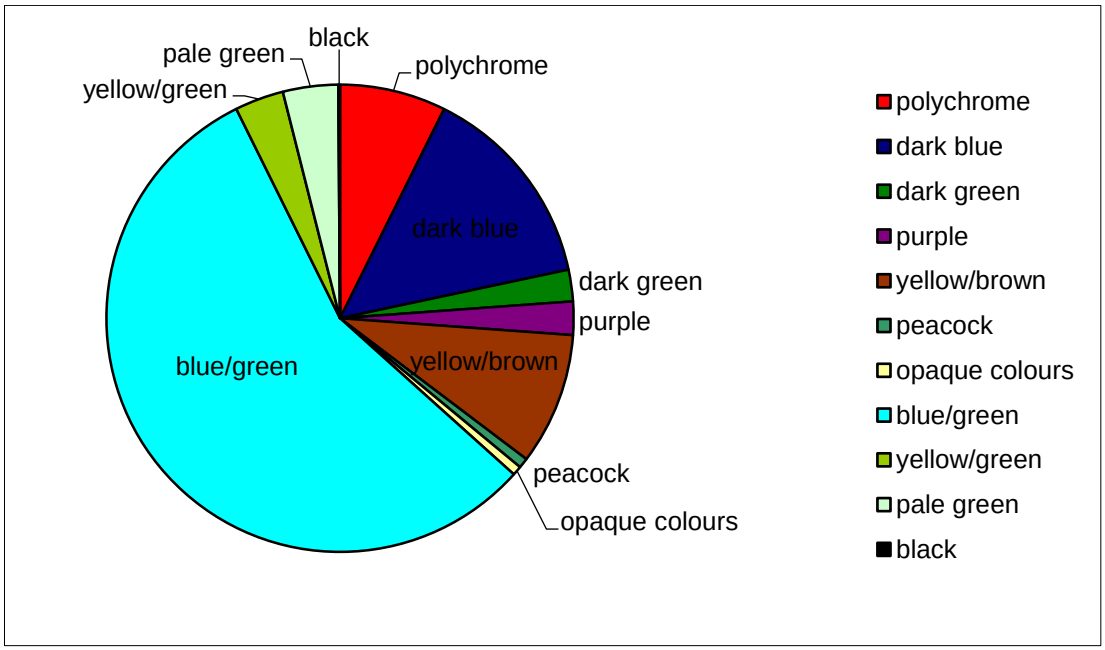

Fig.1.1a Glass vessel colours, Fréjus (Cottam and Price 2009)

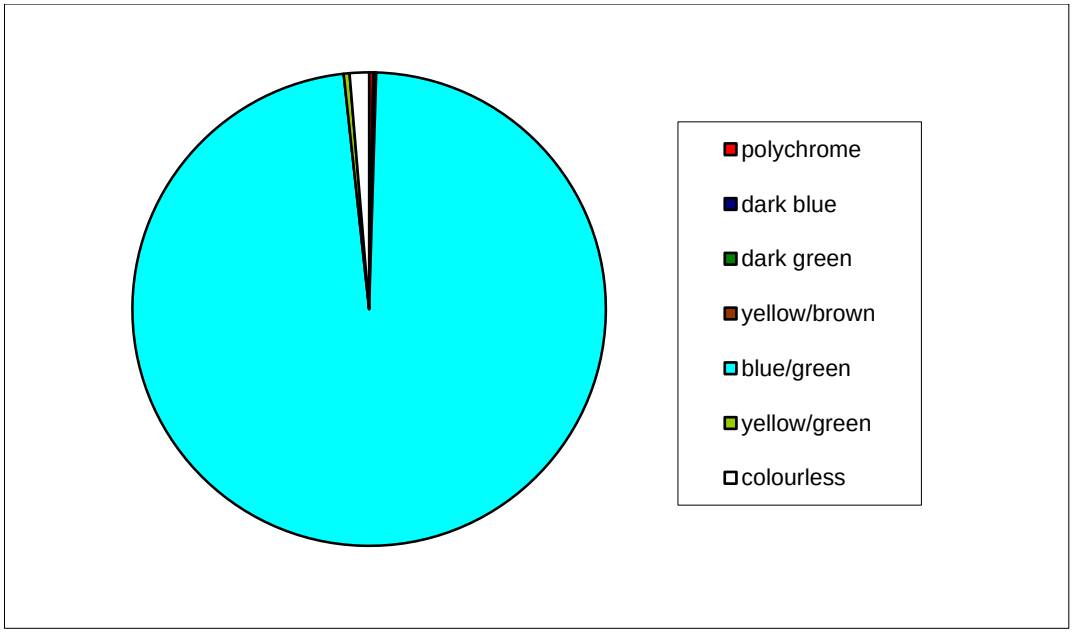

Fig.1.1b Glass vessel colours, Nijmegen (Isings 1980)

Putting naturally coloured blue/green and pale green vessels to one side, there are nine categories of monochrome translucent coloured glass at Fréjus and five opaque colours (opaque green, opaque dark and pale blue, opaque red and opaque white – grouped in Fig.1.1.a as a single category). At Nijmegen, deliberately coloured vessels form only a small group which features no opaque glass and only five translucent colour categories.

The polychrome glass from Fréjus is plentiful and extraordinarily diverse. That of Nijmegen is very limited in both range and quantity. The small group of polychrome glass from Nijmegen consists of three non-blown vessels, and four blown vessels. The non-blown vessels are bowls formed from cane sections of no more than three colours. The polychrome non-blown glass from Fréjus on the other hand is strikingly different in both quantity and complexity. There are 157 fragments from a minimum of 87 vessels, formed using a wide palette of colours (Fig.1.2.a & b). In several examples five or six different colours are employed together. As well as vessels produced from cane sections, at least 18 bowls were formed from thin strips of differently coloured glass, often layered to produce subtle colour combinations (Fig.1.2.b) Another seven bowls were made using twisted bi-chrome rods (*reticelli* glass). A further vessel, made from polychrome strips, incorporates a thin strip of gold leaf encased in colourless glass


a


b

Fig.1.2.a Non blown polychrome glass, and b. Strip mosaic glass, Fréjus © Durham University

Monochrome colourless vessels however are not found at Fréjus at this period (though a few stray fragments from later activity do occur) and colourless glass only appears as a minor element in a limited number of polychrome pieces. Colourless glass vessels are not numerous at Nijmegen, but they have begun to take their place in the range of good quality tablewares of the last decades of the 1st century A.D. Although polychrome decoration is rare at Nijmegen, other decorative techniques are quite frequently used. Facet and relief-cutting, absent at Fréjus, occur on four drinking vessels at Nijmegen. Decorative elements produced whilst the vessel is hot, such as ribs and indents and self-coloured trails are also much more common.

Method of manufacture is another point of contrast between the groups. Taken as a whole, the non-blown glass from Fréjus accounts for a substantial proportion of the assemblage (around 30%). By the end of the 1st century A.D., the decline in non-blown forms is reflected in the proportion of such vessels at Nijmegen (around 4.5% of the assemblage). What is equally striking is the reduction in the *variety* of non-blown forms represented. At Fréjus, over 100 fragments of non-blown vessels in at least 20 different forms were recognised. Only three non-blown forms are represented by the 110 catalogued fragments from Nijmegen and 108 came from convex ribbed bowls (Fig.1.3; Isings form 3).

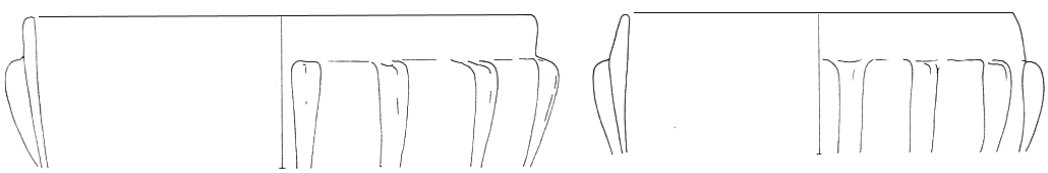

Fig.1.3 Nijmegen, bowls of Isings form 3 (After Isings 1980)

Mould blown tablewares are present in only small quantities at both sites, although Nijmegen has a larger quantity of catalogued fragments – 26 compared to 14. Yet again the contrast lies in the variety of forms represented. At Fréjus, despite the smaller overall number of vessels, there are mould-blown cups and bowls with a variety of profiles as well as an amphorisk. At Nijmegen the diagnostic fragments come from only one general type of mould-blown drinking vessel, straight-sided beakers (Fig.1.4; Isings form 31)

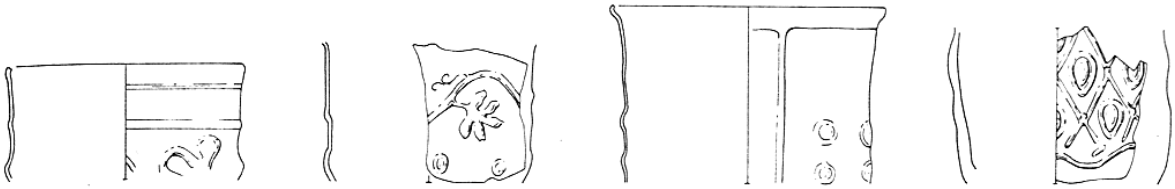

Fig.1.4 Decorated mould blown beakers from Nijmegen (after Isings 1980)

Another marked difference in the two assemblages lies in the number of serving and storage vessels present. Jugs and jars are more abundant at Nijmegen, and perhaps most noticeably, there are more bottles. Bottles were very unusual at Fréjus, and glass seems to have been virtually unused to store large quantities of liquids or semi-liquids.

The processes in the development of glassware production during the mid to late-1st century A.D. identified both in existing analyses and by the direct comparison of these two assemblages can be summarised as follows: -

- A decline in the use of strongly coloured and polychrome glass
- An increase in the use of colourless glass
- Changes in the decoration of tablewares
- An increase in the overall quantity of glass found on archaeological sites
- Establishment of new glass workshops in the western provinces
- Significant changes in the number and variety of forms available, in particular an increasing number of storage and serving vessels

This comparison sets in place the themes upon which this thesis will focus. A brief review of other investigations of archaeological glass will illustrate that whilst there is a lively interest in the technological history of glass and its role in Roman society, a focussed, chronologically precise, multi-site investigation of changes in the production and

appearance of vessels over the second half of the 1st century A.D. has the potential to provide important new data.

1.3 Previous Studies of Trends in Roman Glass Production

1.3.1 Review of the literature

Whilst catalogues and accompanying discussions of glass assemblages from Roman sites are regularly included in excavation reports, contextualised studies of developments in Roman glass are less common. Since the 1980s however there has been an increasing awareness of the contribution that broader interpretations of glass assemblages can bring to questions concerning ancient technology, chronological development and models of consumption. Some have concentrated on specific manufacturing techniques. Grose's landmark publication on pre- and early Roman non-blown vessels provided a comprehensive analysis of form, decoration and dating, using a classification system that is still used thirty years later (Grose 1989). Similarly, and again over an extended timespan, Stern's review of mould-blown Roman glass tablewares, discusses their origin and development over six centuries (Stern 1995). Fleming's discussion of Roman glassware took a broader view of developments and looked at the response of glassmakers to external pressures stemming from political and cultural changes as well as technical innovations within the industry itself (Fleming 1999). More specific studies include Oliver's 1984 analysis of early facet-cut beakers (Oliver 1984) and Howell's study of late Roman 'gold in glass' vessels (Howells 2015). Other research has concentrated on individual colours, for example Cosyns's review of 'black' glass (Cosyns 2011) and the recent 'Project Veinar' on colourless glass in France (Foy et al. 2018).

In 1985 an influential study was produced by van Lith and Randsborg which shifted emphasis away from glass production and typology to focus on consumption, concentrating on glass vessel function at settlement sites in north-western Europe, and the status of glass in burials (van Lith and Randsborg 1985). This revealed general trends in glass use, most notably a significant reduction in tablewares in favour of storage vessels in the later 1st century and into the 2nd century A.D., with a return in dominance of tablewares, in particular drinking vessels, in the 4th century (van Lith and Randsborg 1985, 463).

More recent projects have investigated glass use by different sections of society, for example the discussion of 3rd century cups in Brougham, Cumbria and their possible relationship to gender (Cool 2004; Cool and Baxter 2005), and the review of Roman glass on native sites in Scotland (Ingemark 2014). Cool took a further step in recognising the potential of the information stored in specialist glass reports to inform wider archaeological scholarship in her exploration of eating and drinking habits in Roman Britain (Cool 2006). The study drew attention to questions concerning the role of glass vessels in different social contexts and brought glass together with finds in other materials to illustrate how the size and shape of vessels can provide clues to what it being consumed at table.

At the same time, traditional glass reports on excavated assemblages have continued to be published, usually incorporated into site-specific excavation reports but sometimes as stand-alone in-depth investigations. Of particular importance is the study of the large group of glass from excavations in Colchester (Cool and Price 1995, 211-23). This took a narrative approach to changing trends in glass production. The authors presented seven hypothetical assemblages at intervals in the nearly 400-year history of Roman Colchester to establish the types of vessel that were in contemporary use. The dating of the forms derived from associated chronological information from the 1971-1985 excavations at Colchester, earlier excavations in and around the town and comparative dating of similar forms on other sites. This broad-brush appraisal provides a useful overview of glass changes in the town and beyond. For the period A.D.43-100 however, only two phases of glass use are presented, divided by the Boudican destruction of A.D.60/1 (Cool and Price 1995, 211-5 figs.13.1-2). Consequently, there is no comprehensive analysis possible, within the constraints of this single site, of this key period in glass development.

In the majority of reports on excavated glass assemblages, the available dating is too wide to allow anything more than a generalised site-specific commentary on changes in glass use. The dated sequences are largely based upon the association of glass fragments with ceramics and coins, providing only an approximate date for the occurrence of particular glass forms. Precisely dated events visible in the archaeological record are not common and one site alone cannot be expected to provide a sequence of such horizons. Certainly, the presence of Boudican destruction levels at Colchester has the potential to draw one

firmly dated line through a stratified sequence, but that single event only has limited value when constructing a detailed typological framework. The changes in glass use observed in each of these studies are considered in the context of the site in question and although wider theories can be extrapolated from single site assemblages, there is always the risk that the changes noted are particular to the circumstances of that individual settlement, perhaps reflecting local trade and production systems.

1.3.2 The contribution of scientific analysis

Compositional analysis of glass has played an increasingly important role in ancient glass studies since the 1950s and 60s, with the British Museum research laboratory and the Corning Museum of Glass leading the way. Over the last twenty years, the identification of sources of sand has brought about a profound re-appraisal of raw glass production, with ramifications for the entire Roman industry (Freestone et al. 2000, Foy and Nenna 2001, 32-33; Picon and Vichy 2003; Freestone 2005; Degryse ed. 2014; Freestone et al. 2015). These studies recognised a division of production, in which raw glass was manufactured from its component ingredients in a limited number of large furnaces whilst the formation of glass vessels took place in numerous secondary workshops across the empire. This concept plays a key role in the interpretation of the data in this thesis (Chapter 7.1-7.2 and 8.6). Compositional analysis has also cast light on differences in glass recipes across the Roman period (Freestone et al. 2006) and within specific groups of vessels (Jackson and Cottam 2015). Other valuable projects have been those that combine analysis with a close consideration of form, colour, date and location, such as the analysis of material from the glassmaking site at Jalame (Brill 1988), the glassworking waste at Basinghall Street, London (Freestone et al. 2016), the project investigating the composition of a range of colourless vessel forms (Jackson, Baxter and Cool 2003) and the analysis of polychrome vessels (Freestone and Stapleton 2015).

1.4 Scope and Structure of the Thesis

1.4.1 Questions of methodology

The above review of some of the approaches to glass research in recent years illustrates the breadth and vitality of the discipline. The purpose of this thesis is to add to this body of research by investigating one of the most significant periods in the development of

Roman glass. It will use an original and ambitious methodology to pinpoint more accurately when changes in the appearance of glass vessels occur. The approach differs significantly from many previous projects in that rather than focussing on a single site, or a single vessel category, it will take a defined period from c.A.D.40 to the turn of the 1st/2nd century A.D. across a range of sites, to assess how far it is possible to establish a close chronological pattern for these developments. The research requires a thorough understanding of how glass behaves in different archaeological contexts, a comprehensive knowledge of 1st century glass vessels and an ability to identify individual forms from small fragments. It also involves an understanding of how information from other sectors in glass research (for example compositional analysis) can be integrated with more traditional typological techniques to obtain a more nuanced picture of changes in glass production.

This thesis will therefore take a different path to the studies outlined above. It will look in more detail at a wide range of characteristics relating to glass vessels of the mid-late 1st century, relating to method of manufacture, vessel form, colour and decoration to give a clearer picture of how glass changed both functionally and aesthetically within a short period of time. This will involve the construction of a more refined chronological sequence of the changes across a wider sample group than has previously been attempted. The thesis will combine analyses of carefully selected glass assemblages from well dated contexts, distributed at intervals throughout the later 1st century. This will be followed by a discussion of some of the patterns revealed. Only when it is possible to pinpoint with some accuracy the developments in glass production outlined above, can we place the results in the wider context of the changing social and economic landscape of the western provinces during the second half of the 1st century A.D.

The formulation and testing of a new and innovative method of calculating changes in glass use forms a central part of the thesis (chapters 2-4). The method combines tabulated presentations of results alongside a narrative approach which allows the data to be assessed within the context of the sites from which it has come. Whilst the thesis includes information from many individual sites in Britain, the Rhineland frontier, France and Italy, there are undoubtedly assemblages from other regions which could be added to the body of data given additional time and resources. The geographical extension of the study area to incorporate contemporary groups from Spain, North Africa, eastern Europe and

the Middle East would be profitable. Furthermore, future work will no doubt yield new closely dated groups which could be included in the study. The structure of the thesis has therefore been designed with the future expansion of the data-set in mind.

1.4.2 The structure of the thesis

The first part of the thesis (chapters 2-4) will identify the groups relevant to the study and present the key features of each assemblage regarding methods of manufacture, colour, decoration and form. Chapter 2 will review the characteristics of glass vessels around A.D.40, the starting point for this study. It will include a summary of the forms and features that will be encountered during the analysis of the data and discuss how these features will be monitored during the data-gathering stage. Chapter 3 will examine approaches to the dating of archaeological glass, the relevance of the most widely-used typologies and the challenges to be overcome in the collection and analysis of wide-ranging and disparate data groups. There will also be a brief account of the processes affecting glass deposition and recovery on archaeological sites, and how these might influence data interpretation. It will conclude with an inventory of the assemblages to be examined. In Chapter 4 the profile of each selected assemblage will be presented in a series of dated groups or 'bands'. Notable forms and features will be highlighted and illustrated. A summary of data relating to manufacture, form, colour and decoration will be added after each chronological section.

Chapters 5-6 will draw together the data from Chapter 4 and will use it to plot the trends that emerge. Changes in vessel form and decoration will be discussed in Chapter 5 whilst Chapter 6 will investigate the use of colour in glass in the second half of the 1st century and look in detail at the occurrence of the major colours during this period. The glass-making industry will be the focus of Chapter 7, where changes in technologies will be discussed in light of the trends identified in previous chapters. Topics covered will include developments in raw glass production, the scale of production, the relationship between glassworkers and coloured glasses, and the influence of glass working techniques on vessel form and finishing. Chapter 8 will provide a discussion of wider factors in the Roman world that might have played an influential role in the manufacture and consumption of glass, such as patterns of production and trade, political and military

events which might have influenced glass styles, and trends in glass relative to other categories of decorative media such as wall-paintings, mosaics and decorated ceramics.

An analysis of this type, concentrating on this important episode in glass history across the wide panorama of the western provinces, has not previously been attempted. It is inevitably an ambitious project, but by targeting specific groups of glass, either directly accessible for study or published in detail, an achievable one.

Chapter Two
Selection of Data Categories

2.1 Introduction

Before a detailed examination can be attempted of glass from the period c.A.D.40-c.A.D.100/110 it is important to establish the main characteristics that will be tracked during data collection. As we have seen in Chapter 1, the variety in the appearance of vessels is one of the defining qualities of early imperial glass production. Glass was used for a range of functions, from eating and drinking at table, to serving and storage. An extraordinary palette of colours and many styles of decoration were used in vessel manufacture. In this chapter, inventories will be drawn up of the principle features relating to the form, colour and decoration of vessels during the period under investigation. Section 2.5.1 will describe and list the range of colours in use. Other types of decoration will be set out in Sections 2.5.2-4. Finally, an inventory of the main forms to be monitored will be given in Section 2.6. The forms and features in these listings will relate directly to the data collected in Chapter 4.

First though, there will be a discussion of what glass was like in the years immediately preceding the period covered in this thesis. This short review (Sections 2.2-2.4) will outline the techniques by which vessels were being manufactured, the forms that were present and the range of colours and decoration already in use. Drawing on information from published assemblages dating to the second quarter of the 1st century A.D., it will serve as a starting point for the chronological analysis, illustrating the character of typical glass assemblages and providing context for the data collected in Chapter 4.

2.2 Quantities of Glass in use in the Augustan-early Claudian Period

Glass assemblages from sites occupied up to the end of the 1st century B.C. are invariably small, consisting of no more than a handful of fragments. Two important assemblages, from the *Forum Romanum* and the Palatine in Rome illustrate this relative paucity of glass (Grose 1977a, 16-25).). The first assemblage, of 12 fragments, from the Regia, can be convincingly dated to between 37/6 B.C. and the first decade of the 1st century A.D. The

second, with 13 fragments, from the 'House of Livia' on the Palatine can be dated to the mid-late 1st century B.C. These groups, Grose argues, illustrate the limited availability of glass as a commodity, even at the very heart of the Roman world. Excavations at the *colonia* of Cosa reveal a significant increase in the amount of glass in circulation in the early-mid 1st century A.D. The site produced a maximum of 30 vessels from the entire first two and half centuries of occupation up to the early Augustan period, compared to the hundreds of fragments from contexts dating to the subsequent 50 years (Grose 1977a, 9-10).

At Fréjus in south eastern France (mentioned in Chapter 1) there is evidence of a remarkable increase in the amount of glass being used during the early decades of the 1st century A.D. In the Augustan levels, only 68 fragments of glass were found. In the subsequent phase (c.A.D.15-A.D.40/50) there is a rapid expansion in glass deposition with around 2,500 fragments recovered, a figure that excludes material from a large Gaian/Claudian dump (Cottam and Price 2009). Evidence from elsewhere in south-eastern France points to a growing familiarity with glass vessels. The extensive cemeteries at Nîmes (Sternini 1990-1), Arles (Foy 2010) and Valladas, Saint-Paul-Trois-Châteaux (Foy and Nenna 2001, 124-7, 170-1), all contain important collections of glass vessels from the early-mid 1st century A.D. onwards.

However, during the same period, in the parts of France beyond the Mediterranean littoral and the Rhône valley, glass from occupation sites and burials remains scarce. A study of one particular group of bowls, known as 'linear-cut bowls' (Fig.2.1), from sites in France illustrates this pattern of distribution particularly effectively. These bowls are one of the most frequently noted forms on later 1st century B.C. and early 1st century A.D. sites across the Empire. A comprehensive census of the form in France reveals a striking difference in the numbers found in Provence and the Rhône valley compared with sites further west and north (Foy et al. 2008, 13-23, map.2). In those more peripheral areas, only nine sites produced examples of the form and just two (Toulouse and Rodez) produced more than five.

Fig 2.1 ‘Linear-cut’ bowls from Fréjus (© Durham University)

The available evidence therefore suggests that in the 1st century B.C. and into the very early 1st century A.D., glass was in limited use. Later groups from sites such as Cosa, Fréjus and elsewhere illustrate how, in the Mediterranean basin at least, glass vessels began to become more numerous from the Augustan period onwards, whilst remaining relatively rare further north.

2.3 Manufacturing techniques

Until the mid-late 1st century B.C. glass vessels were manufactured by two principal methods. Core-formed vessels were produced using a technique that had existed for many centuries, mainly to create small unguent containers and amphorisks (Harden 1981). By the end of the 1st millennium B.C., core-formed vessels had all but disappeared, and these forms are therefore not directly relevant to this study (Feugère 1989). At the beginning of the Augustan period glass tablewares were primarily produced using techniques described in this thesis as ‘non-blown’. This term is preferred here as a catch-all expression encompassing a variety of procedures often grouped together under the label ‘cast glass’[1]. However, it has become increasingly evident to glass specialists that use of the word ‘cast’ has significant drawbacks when used to describe processes connected with glass manufacture, as it suggests that glass was poured into moulds in a similar fashion to molten metal. The details of the particular practices that may have been used to make non-blown vessels during the Roman period are still disputed, but they were undoubtedly the product of complex, highly skilled and lengthy production processes. Examination of

[1] http://www.romanglassmakers.co.uk/nl6text.htm for a discussion of the term in the context of the manufacture of Roman forms under modern conditions.

traces on the surfaces of finished vessels indicates that many were created by allowing a disc of hot glass to extend over a domed ceramic former. Horizontal abrasion on the vessel surfaces indicates that vessels, once cooled, were polished either on the inside surface only, or on all surfaces (see Grose 1989 and Cool and Price 1995, 13, for a review of production methods).

These non-blown processes favour the production of open convex vessels, usually bowls. Many have a simple profile, such as the linear-cut bowls mentioned above and other convex plain and ribbed bowls (e.g. Isings forms 1 and 3). Other non-blown cups and bowls closely parallel forms familiar from 1st century A.D. ceramics, including cups with a double curved profile (Isings form 2) and cylindrical bowls (Isings form 22). Most of these non-blown bowls are monochrome, but the process of using a pre-formed disc of glass also enabled a significant quantity of polychrome vessels to be manufactured from fused multi-coloured glass strips and canes.

Although many non-blown forms remained in common use into the 1st century A.D., they were joined and eventually outnumbered by a host of blown forms. The introduction of blown glass in the Roman world, usually considered to have occurred in the eastern Mediterranean around the middle of the 1st century B.C. (Israeli 2005), had a profound influence on vessel form. However, glass produced using this technique seems to have been adopted gradually and blown glass vessels are not encountered with any frequency until the turn of the millennium. In his review of Augustan assemblages from Rome and elsewhere in Italy, Grose suggests that blown glass appeared there 'during the first century B.C, possibly as early as 40/30 B.C.' but remained 'relatively uncommon until the age of Augustus' (Grose 1977a, 27). The first appearance of blown forms in Roman Gaul occurs at sites in the Rhône valley and along the Mediterranean littoral (Foy and Nenna 2003, 232). These early vessels tend to be small, thin-walled flasks or unguentaria, with cups and bowls being more rare (Foy and Nenna 2003, 232). In the small group from the earliest phase (c.30 B.C - c.A.D.10) at Ilot VI at Olbia de Provence, eight of the 12 vessels were non-blown bowls and three were blown vessels (Fontaine 2006, 349-50 tab.3). In Lyon, two sites from the decades surrounding the turn of the 1st millennium illustrate the continuing prominence of non-blown glass. At the site of the possible sanctuary of Cybele, abandoned around A.D.10, blown glass forms only 17% of the group (Desbat 2003, 401 Fig.2). At the slightly later Verbe Incarné site (5.B.C. to A.D.20)

blown glass is more frequent, forming 30.5% of the vessel glass assemblage. (Leyge and Mandy 1986, 12-17 tab.1). The picture is slightly different at the Mediterranean port of Fréjus. During the earliest phase at the Villeneuve *quartier* (10-5 B.C - A.D.10-15), blown glass is already in the majority, with 24 fragments (35.3 %) coming from non-blown vessels and 44 fragments (64.7 %) from blown vessels (Cottam and Price 2009, 186).

Further north, in the glass assemblages at the Augustan military camps on the river Lippe in Germany, both techniques are used, but again blown forms are restricted to drinking vessels and flasks. At Oberaden (occupied probably c.11-8 B.C.) 22 fragments of glass were found representing 10 non-blown polychrome bowls, three blown cups and three small blown flasks (Tremmel 2006, 278-80, taf.1, 3 and 7). Non-blown vessels are also in the majority (c.60%) at the legionary camp at Haltern, occupied from c.5 B.C. to c.A.D.9 and the range of blown forms is restricted to three beakers and around 40 small flasks and unguentaria (Tremmel 2006, 263-273, taf.1-3, 6-7, 9). However, at Anreppen, occupied in the first decade of the 1st century A.D., blown vessels dominate, though again the forms are very restricted, and only small flasks and unguentaria were identified (Tremmel 2006, 274-77, taf.2-3 and 7).

It is difficult to identify the exact point at which the discovery was made that glass could be blown into moulds to control both form and decoration, though it is generally thought that mould-blowing developed from a knowledge of free-blowing (Price 1991a, 64; Stern 1995, 65-66). Stern lists finds from dated sites in the western empire, putting the earliest at around A.D.35-45, though she suggests that the technique may have been practised earlier in the eastern Mediterranean, perhaps in the early 1st century A.D. (Stern 1995, 66). Despite being a relatively novel technique, a wide range of mould-blown forms was in production by the mid-1st century, as well as a nascent mould-blown bottle industry[2].

[2] Mould-blown bottles are recorded in Augustan contexts at Magdalensberg, Austria (Czurda-Ruth 1979, 135) but those examples seem to lie significantly outside the chronological picture provided by other dated groups.

2.4 Survey of Vessel Characteristics in the Tiberian/early Claudian period

By the second quarter of the mid-1st century A.D., the amount of glass being used and deposited at sites in Italy and the western provinces is large enough to allow certain vessel forms, colour, decoration and finishing techniques to be recognised as occurring with particular regularity. This section will review the main trends in the appearance of glass vessels in the years immediately preceding the selected timespan of the study with a view to identifying those features to be monitored during data collection. Existing typologies (e.g. Isings 1957, Goethert-Polaschek 1977, Rütti 1991) can provide general information but a more comprehensive illustration of form, colour and decoration of the glass can be achieved by looking more closely at some of the best known dated deposits from this period. For this purpose, particular reference will be made to the following groups:-

- Glass from the *colonia* of Cosa (Grosseto, Italy) uncovered in the debris of a collapsed wall, dated to A.D.30s-c.A.D.40 (Grose 1974, 1977b, 1991 and 2017).
- The assemblage of glass retrieved from the 'La Nautique' site at the port of the *colonia* of Narbonne (Aude, France) and dated A.D.30-c.55 (Feugère 1992).
- A large dump of glass known at the *dépotoir* from Fréjus (Var, France) dated to the Caligulan/Claudian period (Cottam and Price 2009).
- A small group from the military site at Aulnay-de-Saintonge (Charente-Maritime) dated to the decade A.D.20-30 (Santrot and Santrot 1983; Tassaux and Tassaux 1983).
- A richly furnished burial at the Nécropole du Clousi, Saintes (Charente-Maritime) dated to A.D.40-60 (Chew 1988).
- Selected burials dated to between A.D.20 and 50 in the canton of Ticino, Switzerland (Biaggio Simona 1991).

2.4.1 Glass vessel forms, c.A.D.25-50

By the second quarter of the 1st century A.D., all three principal methods of manufacture of Roman glass, non-blown, mould-blown and free-blown, were in regular use. Free-blown vessels make up the majority of recognised forms in these assemblages, with non-blown vessels rather less common and mould-blown vessels, both tablewares and storage

bottles, relatively rare. In the largest assemblage, the Fréjus *dépotoir*, non-blown vessels made up 12.5% of the total. A core-formed alabastron or amphorisk is a highly unusual late survival in the *dépotoir* at Fréjus and is not seen at any of the other sites. At the 'La Nautique' site at Narbonne, non-blown vessels made up just over 20% of the group, though as a port deposit it is possible that the loss of individual consignments of particular vessel forms might influence these figures.

Amongst the non-blown bowls, varieties of ribbed bowl (Isings form 3) are almost invariably present. Examples were found at all the sites with the exception of the Ticino burials and so the form certainly appears to be widespread and in common use. Deep and shallow bowls with prominent ribs (Isings form 3a and 3b) came from Fréjus, Aulnay-de-Saintonge (figs.2.2.a and b) Cosa, and Narbonne and bowls with short close-set ribs (Isings form 3c) came from Fréjus, Aulnay-de-Saintonge, Saintes (Fig.2.5 bottom left) and Narbonne.

Linear-cut bowls are also present in the Fréjus group (Fig.2.1), though only in small numbers (3%) whereas later ribbed bowls of Isings form 3 accounted for 8.5% of the assemblage. A single linear cut bowl is also in the group from Narbonne, but the overall impression is that by A.D.40 the form had all but disappeared. Their near absence from conquest period sites in Britain would support this. Other forms of non-blown convex bowl are still present, either monochrome or formed from polychrome strips, bichrome twists or cane sections. Strip mosaic and twisted cane (*reticelli*) bowls are uncommon, and in these assemblages only occur in the Fréjus *dépotoir* and Aulnay-de-Saintonge. Bowls with composite cane sections of rods, floral motifs or spirals occur in small numbers at Fréjus and at Cosa.

A further group of polychrome and monochrome non-blown vessels defined by Grose as 'fine wares' (Grose 1989 254-56, 304-7; Grose 1991), comprises a diverse collection of high quality vessels polished on all surfaces, several of which have profiles that can be compared with ceramic fine ware bowls. Grose dates the group to the second quarter of the 1st century with the possibility of later production. Here they are seen at Fréjus, Narbonne and Cosa (Fig.2.2.c-f).

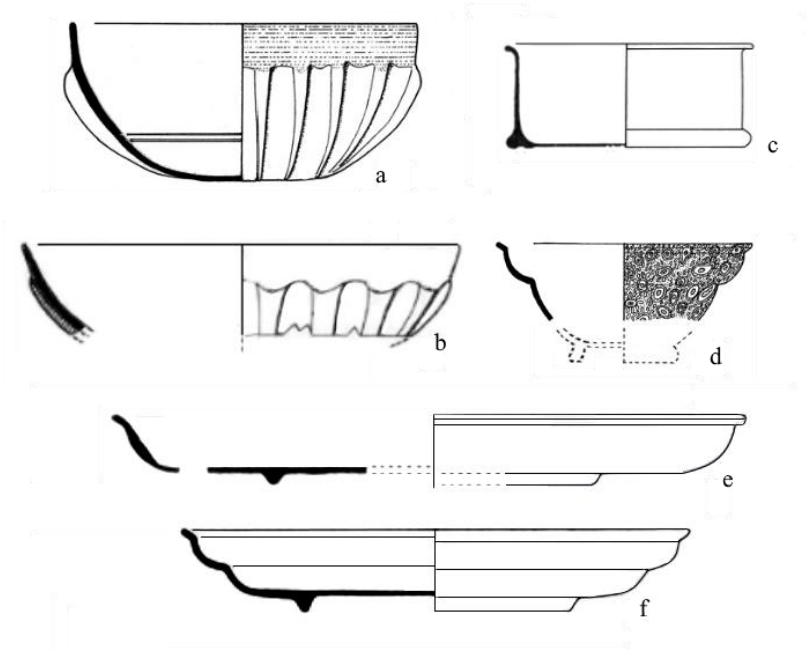

Fig.2.2 Non-blown bowls from Fréjus (a and d), Aulnay-de-Saintonge (b), Cosa (c and e) and Narbonne (f) (Drawings © Y Beadnell, J Huffstot, H Chew, M Feugère)

Whilst the range of blown glass vessels from the Augustan sites noted above (Section 2.3) seems to be rather restricted, evidence from Tiberian-Claudian deposits suggests that it was at this point that the full potential of blowing techniques began to be fully exploited. The small globular and piriform flasks found in Augustan contexts are joined by other closed forms, with more sophisticated profiles and features, such as spherical and bird-shaped unguentaria (Isings forms 10 and 11) and various forms of jugs and amphorisks (Isings form 15). The smooth inside surface produced by blowing, which dispensed with the need for internal polishing, seems also to have encouraged the production of narrower drinking vessels, such as the tall wheel-cut beaker (Isings form 34). Features such as folded rims, handles, and pushed-in and applied bases also add to the diversity of forms.

Glass from the early phases at Fréjus illustrates many of these developments. In the Augustan phase (Phase 1a) only a single larger flask or jug was present and no jars. The range of cup/bowl forms was limited to four convex cups and a simple convex bowl (Cottam and Price 2009, 186 footnote 5). In the succeeding phase (Phase 1b, c.A.D.10/15-40/50), the range of blown vessel forms becomes much more diverse, illustrating the extent to which blown production techniques had developed during the early decades of the 1st century.

Blown cups with horizontal wheel-cutting are the most common drinking vessel form and are present in all these assemblages (Isings form 12). They are usually monochrome but a few polychrome examples are present (for example Fréjus and Ticino Fig.2.3.f). The rim edge is cracked off, and often tapers slightly inwards (Fig.2.3.d), or is curved (Fig.2.3.c). Beakers with similar horizontal cutting and rim finishing are less common, but occur at Fréjus, Narbonne and Cosa (Fig.2.3.a and b).

Small convex bowls with curved rims and tooled ribs, often decorated with horizontal opaque trails are one of the most distinctive forms of this period (Isings form 17). They appear in the second decade of the 1st century and are seen here at Narbonne, Cosa, Fréjus (Fig.2.3.c) and Saintes (Fig.2.5 bottom right).

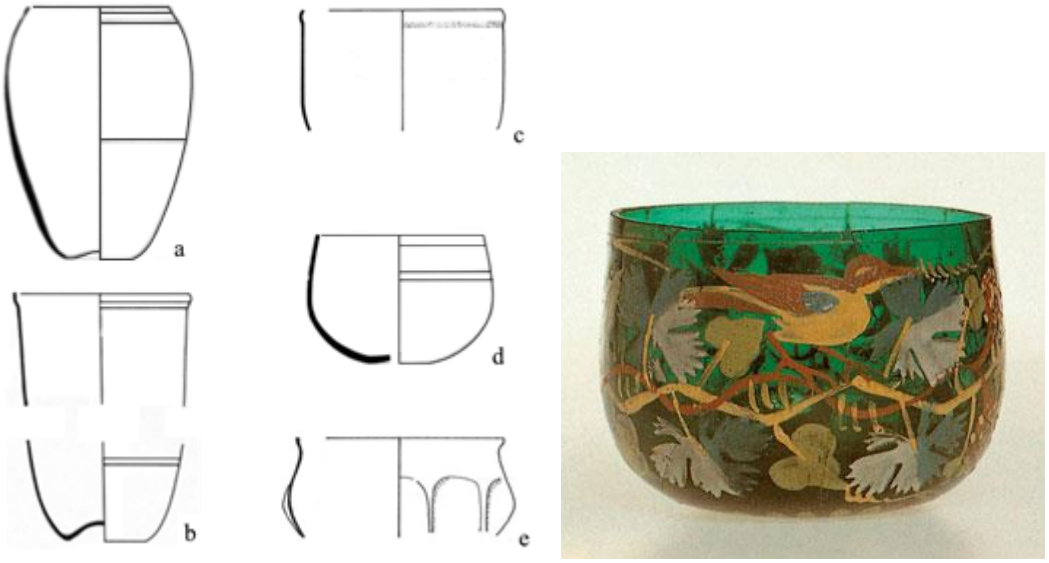

Fig.2.3 Blown beakers and cups from Narbonne (a and d), Cosa (b), Fréjus (c and e) and an enamelled cup from a burial in Ticino canton, Switzerland (f) (Drawings © M Feugère, J Gauthy, Y Beadnell. Photo C Jackson)

The commonest form of blown bowl has a tubular or rounded rim and an applied base ring or, more rarely, a separately blown foot. These forms are present at Cosa (Fig.2.4.c) Narbonne, and Fréjus (Fig.2.4.d) and are particularly numerous in the Ticino burials.

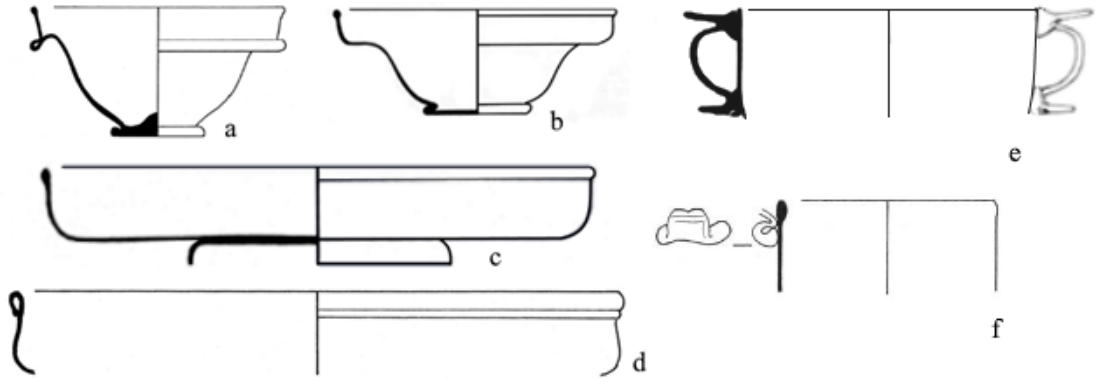

Fig.2.4 Blown bowls from Fréjus (a, d and f) Cosa (b and c) and Narbonne (e)

Other blown bowls include vessels with stepped profiles, seen at Cosa and Fréjus (Fig.2.4.a and b), and straight or slightly convex sided bowls with two handles, usually termed *scyphi*. Several handled bowls came from Fréjus and Narbonne (Fig.2.4.e and f), and two came from the burial at Saintes (Fig.2.5, far right and second from top left).

PICTURE NOT AVAILABLE: copyright rests with J F Bradu; picture can be viewed at http://jfbradu.free.fr/celtes/les-celtes/verre-saintes2.jpg

Fig.2.5 Vessels from the Nécropole du Clousi, Saintes © JFBRADU

The *dépotoir* at Fréjus also included a number of large deep cups or bowls with wide, often stepped rims and applied bases, a form often described as canthari (Isings form 38; van Lith 1991; Price and Cottam 1998, 68-70). A yellow/brown example without handles came from a burial at Saintes (Fig.2.5 centre top). These vessels appear to come to prominence in the early Claudian period and may demonstrate an increasing role for glass

as a vehicle for display, as suggested by their depiction in wall paintings, as at Pompeii, as containers of fruit or wine (Naumann-Steckner 1991, pl.XXIVb).

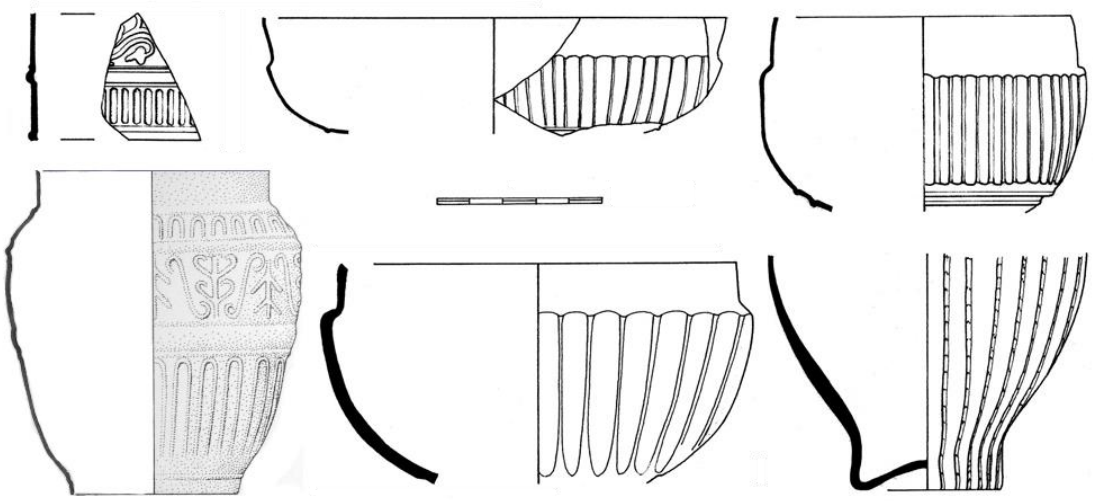

Fig.2.6 Mould blown tablewares from Narbonne (bottom left) and Fréjus.
(Drawings © Y. Beadnell, J Huffstot, J Gauthy)

Only small quantities of mould-blown tablewares are present in these groups (Fig.2.6). Most are drinking vessels, in particular cylindrical and ovoid cups found at Fréjus, Cosa and Narbonne. At least three mould-blown ribbed bowls came from Fréjus, and a matching pair of flasks came from the Saintes burial (Fig.2.5 centre front). Mould-blown storage vessels such as bottles are scarce in these assemblages. Two sites produced examples of prismatic bottles, Cosa and Narbonne. Some handle fragments from the Fréjus *dépotoir* may also come from bottles. The examples are all small and thin-walled in comparison to bottles from later decades.

2.4.2 Developments in Colour

The extent to which colour is used in early imperial glass has long been acknowledged and celebrated. A close look at assemblages from the second quarter of the 1st century illustrates the wide range of polychrome and translucent and opaque monochrome colours across the sites (Table 2.1). All the colours used in Hellenistic glass production and in Augustan vessels are still present in the second quarter of the 1st century A.D. They are joined by dark emerald green, which becomes one of the most popular strong translucent

colours, particularly in the production of ‘fine ware’ non-blown vessels (Grose 1991, 2, 8).

	Cosa	Ticino	Narbonne	Saintes	Aulnay	Fréjus
Poly-chrome	✓	✓	✓	✓	✓	✓
Opaque blue						✓
Opaque white		✓				✓
Opaque red						✓
'Black'			✓			
Purple	✓	✓	✓			✓
Dark blue	✓	✓	✓	✓	✓	✓
Dark green	✓	✓	✓		✓	✓
Yellow brown	✓	✓	✓	✓	✓	✓
Blue green	✓	✓	✓	✓	✓	✓

Table 2.1 Colours of monochrome vessels from selected sites of the second quarter of the 1st century A.D. (Column colours are general approximations as each colour has a wide range of shades)

Polychrome vessels, both non-blown and blown, are present at all of the sites (Table.2.1). In the Fréjus *dépotoir* a quarter of the ribbed bowls of Isings form 3, the commonest non-blown bowl form, are either polychrome or strongly coloured. The proportion of polychrome and strongly coloured blown vessels is rather less (10.5% of the total blown glass in the *dépotoir*), but is nevertheless still significant. The quantity of polychrome

glass in the Ticino burials is also notable. Several of the jugs and amphorisks are decorated with opaque white splashes, and opaque white trails are used on bowls and flasks. A dark green cup with an enamelled design of birds and vine leaves represents a decorative technique that appears to have first developed on glass of the Tiberian period (Rütti 1991, 134-5; Fig.2.3.f). A further example of the increasing complexity of workshop practices at this point is the small polychrome ribbed bowl (Isings form 17) that combines three forms of decoration - tooled ribs, contrasting applied trails and horizontal abrasion.

	Cosa	Ticino	Narbonne	Saintes	Aulnay	Fréjus
Non-blown						
Reticelli (lace)					✓	
Strip mosaic						✓
Cane sections	✓					✓
Blown						
Enamelled		✓				✓
Splashes/blobs /grains	✓	✓	✓			✓
Trails	✓	✓	✓	✓	✓	✓

Table 2.2 Polychrome glass from selected dated assemblages

These colours recur in glass assemblages during the succeeding decades, and the extent to which this happens will be a key component of the analysis to follow. The widespread adoption of colourless glass in vessel manufacture represents one of the most fundamental developments in the Roman glass industry and announces the arrival of a new aesthetic in this sector of Roman material culture. Colourless glass is very rare before the middle of the 1st century A.D. It is occasionally used as an element in polychrome non-blown glass (for example strip mosaic and lace/*reticelli* vessels). Very rarely, complete vessels are produced in colourless glass. Items listed as "colourless" in catalogues of glass of the early-mid 1st century, are however often found to be very pale green or yellowish glass, and not the crystal clear colourless glass known from later decades. For example, a jug from tomb 12 of the Liverpool Villa site, Muralto, described as 'colourless' is on close examination a very pale greenish-colourless. A colourless wheel-cut cup from Cosa on

the other hand, appears to be intentionally decolourised and stands out as a particularly early example of a colourless blown vessel.

2.4.3 Summary

Several general observations can be made concerning the range of forms in use in the period immediately preceding the starting point of this study. All three manufacturing methods are in use, with blown vessels in the majority. Non-blown vessels make up about 10%-15% of the assemblages, but include only a limited range of forms, concentrating on bowls. One non-blown bowl form is particularly prevalent, non-blown ribbed bowls of Isings form 3. Mould blown vessels are uncommon, but show a slightly wider range of forms, including drinking vessels and bowls as well as small flasks. The greatest range of forms lies within the blown vessels, with drinking vessels forming the largest sub-group. Whilst blown jugs are present in several of the assemblages, they are not common, and jars are absent. The quantity and variety of flasks and unguentaria is by contrast quite notable, with a number of new forms introduced, including 'novelty' forms such as bird-shaped and globular unguentaria (Isings forms 10 and 11).

One of the most interesting aspects of these assemblages is the longevity of certain forms through the first half of the 1st century A.D. A number of forms present in Augustan groups still occur thirty or more years later, such as non-blown convex bowls (Isings form 1/18) and ribbed bowls (Isings form 3), blown convex wheel-cut cups (Isings form 12) and tubular rimmed bowls (Isings form 44/5). A partiality for polychrome and strong colours is as noticeable as ever. The range of colours exploited is identical to that seen on Augustan sites, with the addition of dark green to the palette. Whilst some polychrome varieties amongst non-blown vessels appear to have declined (notably strip mosaic and *reticelli*), polychrome blown vessels are in ascendance and the appearance of innovations such as enamelled vessels suggests that these techniques were thriving. Colourless glass is almost absent from these groups, with just one vessel from Cosa identified as truly colourless.

Ribbed decoration occurs on non-blown bowls, on some mould-blown vessels, and on a limited number of blown vessels (mainly the small bowls of Isings form 17). Wheel-

cutting in the form of horizontal lines and bands is very frequently seen on non-blown and blown vessels alike. More complex wheel-cut motifs and designs, such as facets and figurative scenes are absent. Whilst cameo-cut vessels with mythological and vegetal designs are known in Tiberian and early Claudian contexts, they are exceedingly rare, as witnessed by their absence from the assemblages reviewed here.

This brief discussion provides a general introduction to the form, colour and decoration of vessels in circulation at the point in time at which data collection for the main body of this thesis begins. It provides an indication of the characteristics that are likely to be significant in the decades that follow and serves as starting point for the selection of individual attributes that will be monitored in the analysis presented in Chapter 4. Drawing upon this information, the following section focusses more specifically on the definitions of the colours, decorative techniques and forms that will be included in the data collection.

2.5 Terms used to Describe Colour and Decoration

2.5.1 Colours

The range of monochrome colours used to produce 1st century glass covers nearly all the colours produced during the entire history of the Roman glass industry. Finding verbal definitions for these colours that can be agreed by all is probably an impossible goal. All eyes see colour differently, and even without complications such as colour-blindness, descriptions of different shades are highly subjective. Transparent glass has the added problem in that light passing through the vessel, in combination with differing wall thicknesses can alter shades quite considerably. Some colours are particularly tricky to define, and careful consideration needs to be given to colour descriptions in catalogue entries, even when colour photos are provided. Various techniques for standardising glass colour terminology have been tried. For his catalogue of the glass from Vindonissa, Berger referred to shades from the Caran d'Ache colour pencil range (Berger 1960, 95-6) and Rütti in his catalogue of the glass from Augst and Kaiseraugst used the PANTONE® range of colours (Rütti 1991, 22, Fig.220). These systems have the advantage of providing some consistency within the catalogues, but do not completely address the problem of varying levels of thickness and translucency in the glass.

Unfortunately, the range of colours most frequently disputed are also the most common – the bluish/green shades of untreated glass. Nevertheless, despite differences in colour and intensity, glass that has only been coloured by the natural presence of iron in the sand has a certain tint that makes it recognisable to those who regularly examine Roman glass assemblages. Strongly coloured and colourless glasses were generally obtained by the inclusion of particular minerals in the glass batch and by the control of furnace conditions (Weyl 1951; Jackson, Price and Lemke 2006; Henderson 2013, 68-82). For example, dark blue vessels, when analysed, consistently reveal the presence of cobalt in the mix. The same is true for dark purple (manganese), dark emerald green (copper), yellow/brown (iron), colourless (manganese or antimony). These broad colour categories become familiar to those working frequently with 1st century glass. Unless very subtle colour differences need to be expressed, it is perfectly adequate to use these categories in describing glass, and this approach is taken in this study. Therefore this thesis will use the following colour terms:

- Dark blue

  Dark blue glass occurs widely in the pre-Roman glass industry, in particular in the production of core-formed vessels, and in the production of Iron Age beads. It is one of the commonest strong colours in use in the 1st century A.D. Cobalt-coloured glass has a distinctive deep blue shade and is highly visible in excavated glass assemblages. It is one of the most frequently used base colours in non-blown polychrome glass.
- Dark green

  Dark green (often called emerald green) is a Roman colour and does not occur in the Hellenistic or Iron Age glass industries. The production of dark green glass appears to have been a complex process (Jackson and Cottam 2015). It was nevertheless one of the more common strong colours, though infrequent in blown polychrome vessels with the exception of painted cups.
- Purple

  Purple glass is the rarest of the translucent colours, but was used both for monochrome vessels and as a base colour for polychrome designs.
- Black

Glass that is described as ‘black’ is in reality a very intense dark colour, usually green, yellow/brown or purple. Whatever the actual colour of the glass, the impression and presumably the intention is of a matt black, perhaps emulating obsidian (Cosyns 2011).

- Opaque white

  White glass is rarely used to produce complete vessels, but is often the colour used for contrasting elements in polychrome vessels.
- Opaque yellow

  Opaque yellow is not used to produce monochrome bowls, but like white glass is frequently found in polychrome vessels, in particular as an element in composite canes in non-blown bowls.
- Opaque red

  Opaque red is used occasionally as an element in non-blown polychrome vessels, and rarely to produce complete monochrome vessels. It is hardly used in the production of blown vessels though very occasionally contrasting splashes of opaque red occur.
- Opaque blue

  Opaque blue is the opaque colour most often used in monochrome vessel production, both non-blown and blown. Nevertheless, its use is rare.
- Opaque green.

  Opaque greens and turquoise shades are very rare.
- Yellow/brown

  Yellow/brown can range from a very pale shade, sometimes described as amber, to an intense dark brown. The colour occurs as result of specific furnace conditions affecting iron present in the sand of a basic raw glass mixture, and not as a result of a deliberately added colourant (Jackson, Price and Lemke 2006, 151).
- Yellow/green

  Yellow/green shades again vary, and occasionally can be dark enough to be described as ‘olive green’. Again, yellow/greens may not always be the result of deliberate colouration of the glass, but reflect furnace conditions.
- Pale green

The extent to which pale green is a true colour, or just a variant of natural blue/greenish shades is unclear. It does not seem to occur as a result of the deliberate addition of a colourant. However, it is possible that pale green glass may derive from sands specially selected as having a weaker iron oxide content. It is easily distinguished from blue/green shades and therefore will be treated as a separate colour category.

- Blue/green
  Blue/green is the term most generally used to describe raw glass that has not been subjected to any attempt to colour or decolourise the glass mix.
- Colourless
  Colourless glass is produced by the addition of antimony or manganese to the raw glass batch. This counteracts the influence of elements, particularly iron, in the sand that otherwise generate the bluish/green tones of natural coloured raw glass. Rare in Roman vessels before the mid-1st century, an important aspect of this research will be to try to establish a closer understanding of the chronology of colourless glass.

2.5.2 Decoration on Non-blown Vessels

The many varieties of non-blown polychrome decoration have been examined on a number of occasions in connection with large assemblages containing mid-1st century A.D. glass. Harden produced an innovative categorisation based on the glass from Colchester/Camulodunum in his 1947 report. Here he divided the various polychrome techniques into five categories as follows: A: Laced (*reticelli*); B: Strip mosaic; C: Floral and spiral mosaic; D: Marbled; E: Dappled (Harden 1947, 292-4). These techniques fall into two basic groups depending on whether the component coloured elements (either composite or single colour) are fused together from strips of glass arranged side by side (categories A and B), or from cross-sections of glass rods grouped together (categories C-E). These divisions were retained in the discussion of the glass from Fishbourne (Harden and Price 1971), and with some modifications for other more recent analyses such as Colchester (Cool and Price 1995) and Fréjus (Cottam and Price 2009). In his examination of the glass from Augst and Kaiseraugst, Rütti also used similar categories. He divided the non-blown polychrome into ‘Streifenmosaikglas’ (strip mosaic),

‘Reticella (faden)glas’, ‘Millefioriglas’ (including ‘Gesprenkeltem’ or mottled glass with flecks and spirals) and ‘Blumen’ (floral mosaic). These general descriptive categories are widely employed in modern glass analyses, and some will be retained in this study. However, the detailed categorisation of vessels formed from cane sections will be simplified here, and cane section vessels will be brought together under a single title. This decision has been made firstly because it is often difficult to specify the exact type of composite cane used in vessel formation when fragment sizes are small (as is often the case) and the pattern and arrangement of the canes has been distorted during manufacture. Furthermore, the detailed study of cane use during this period is beyond the remit of this particular thesis.

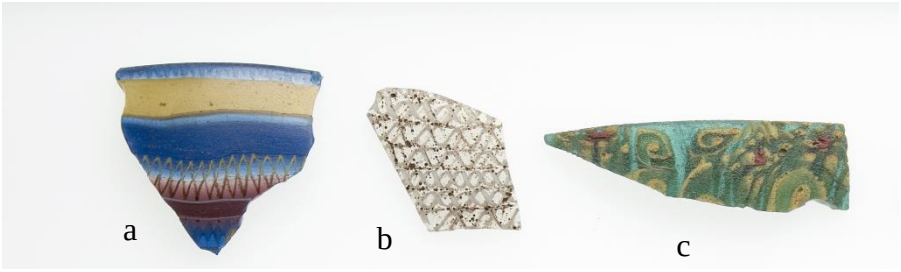

Fig 2.7 Polychrome non-blown glass vessels from Fréjus, southern France showing a) Strip mosaic b) Lace/*reticelli* c) Cane sections (© Durham University)

Three categories of non-blown polychrome glass will be used here

- Strip mosaic (Fig.2.7.a), where rods of glass in different colours are placed side by side, heated and fused together into discs which are then flattened and shaped by the application of further heat into the required vessel shape. Individual strips can be formed from single colours, layers of different colours (for example colourless glass encasing opaque yellow, as seen in Fig.2.7.a), or from twisted *reticelli* rods.

- *Reticelli* or lace mosaic (Fig.2.7.b), where rods of glass are again placed side by side, heated and fused together. The difference here is that each rod is a twisted length of two colours, usually colourless with a thin filament of opaque glass, usually opaque white, blue or yellow.

- Cane sections (Fig.2.7.c) where rods of glass are cut across into sections and grouped together before being heated and fused to form a disc. This disc is then heated further to allow it to be shaped into the vessel form. The cane sections can take many forms. Often, they are clusters of rods in two colours, one forming the main ground colour of the vessel with the other, frequently opaque white or yellow, showing up in section as the polychrome element. Three or more colours can be clustered together to form more complex canes which when cut across have the appearance of flowers with a central dot and surrounding petals. A further common effect is a spiral shape formed by rolling strips of two colours together into a rod, before it is cut into sections.

2.5.3 Decoration on Mould-blown Vessels

Mould-blown tablewares are formed by expanding a gather on the end of a blowing iron into a multi-part decorated mould. Cups and beakers are the most common forms, but small bowls, jugs, flasks and bottles are also known. Some of the most common groups of decoration are:

- Narrow vertical ribs
- Scenes from sporting contests such as gladiatorial combat, chariot racing and very occasionally boxing, with names of participants in Latin
- Mythological characters standing within arcades
- Geometric patterns, including large ovals, sometime surrounded by a raised cordon; circles, meandering lines
- Foliage, sometimes in a winding scroll
- Raised bosses, ‘lotus’ or ‘almond knob’ features, arranged in rows, sometimes within a diamond lattice framework.
- Raised shield-like bosses
- Written mottos, usually in Greek

2.5.4 Decoration on Blown Vessels

Blown vessels show an abundance of different decorative techniques, which can be divided into two main categories (Price and Cottam 1998, 30-37). The first exploited the plastic qualities of hot glass and was undertaken whilst the vessel was hot from the furnace. The second category of decoration involved cutting the vessel surface after cooling. It is very possible to find both types of decoration on the same vessel, as for example on ribbed bowls (Isings form 17), where the ribs were formed whilst the vessels were hot, and wheel-cut lines added once they had cooled.

Blown polychrome glass is usually produced whilst the vessel is hot, though enamelled glass goes through a number of hot and cold stages. There are many different methods of creating polychrome decoration, and the following list covers the types that occur in the dated assemblages studied here.

- Cased (or flashed) vessels have two thin layers of contrasting colour bonded together during vessel manufacture. The layer on the inside of the vessel is almost always opaque white and the outer surface is a translucent strong colour such as dark blue or green. (Fig.2.8.c)
- Abstract polychrome decoration of splashes and blobs is formed by applying chips of glass to the partially inflated gather whilst hot. These can then be smoothed flush with the vessel wall by marvering and further inflation, or left in relief. Opaque white is most common, but other colours are also used. (Fig.2.8.a)
- Trails can be applied to the rim or body of the vessel. They are often horizontal or spiral, but can be looped. They were either marvered to be smooth with the surface of the vessel or left in relief. Opaque white trails are common, but other colours occasionally occur. (Fig.2.8.b)
- Enamelled or painted polychrome decoration is produced by adding contrasting patches of strongly coloured glass, probably as ground powder, to the outer surface of the vessel once it has cooled. The colours are then fixed by re-heating the vessel. Figurative scenes with animal and human figures and vegetal motifs are known, but these vessels are never common. (Fig.2.2)


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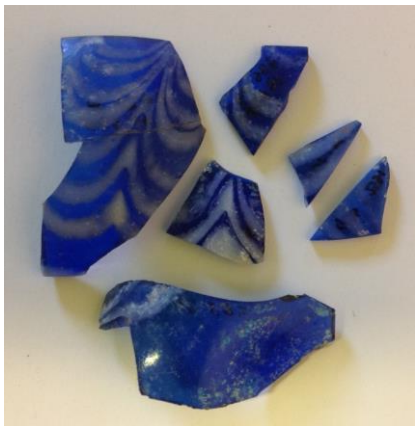

b

c

Fig.2.8 a. Splashes (Lyon) b. Trails (Colchester) c. Cased fragment (Colchester)

Blown monochrome vessels can be decorated whilst hot, or after cooling. The following decorative styles will be noted in this study.

'Hot' decorative techniques: -

- Trails in identical colours to the ground colour of the vessel could be added in a similar fashion to polychrome trails (Fig.2.9.a).
- Indents were formed by applying gentle pressure to the outside of the blown vessel with the edge or the point of a tool (Fig.2.9.b).
- Ribs were pinched out from the body of the vessel using iron pincers and can be shallow or more prominent depending on the pressure applied and the degree to which the vessel is inflated. Vertical ribs are common, by diagonal ribs, and ribs pinched together crossways are also known (Fig.2.9.c).
- Pinched trails are sometimes present below the handle on jugs or around the rim of jugs and bowls. A strip of glass, either extending from the base of the handle or applied to the rim is pinched by a tool to form close-set ridges or 'teeth' (Fig.2.9.d).
- Horizontal folds either at the rim or on the body of the vessel are formed by applying pressure above and below to produce a projecting tube around the circumference (Fig.2.9.e).

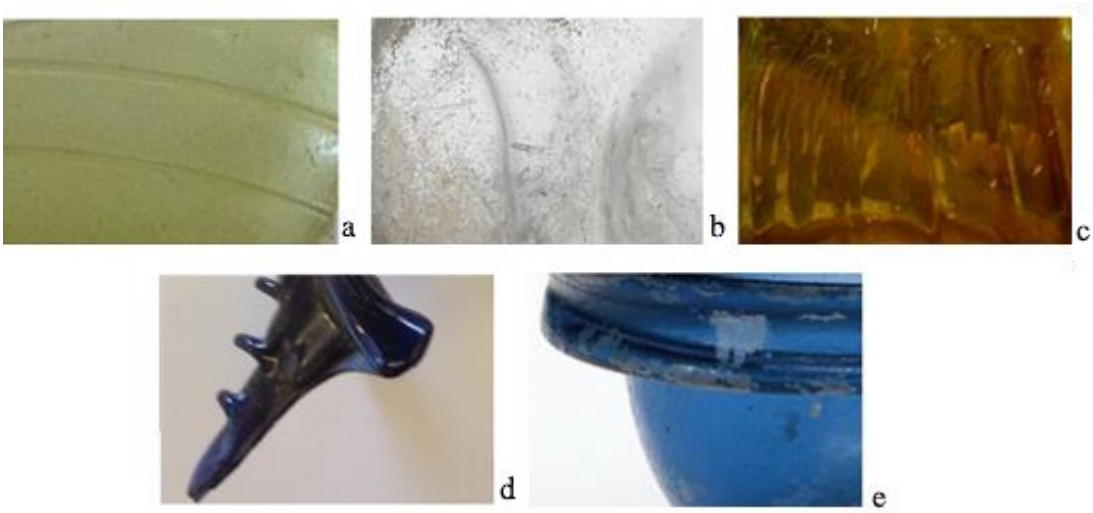


Fig.2.9 ‘Hot’ decorative techniques, a. self coloured trails b. indents c. ribs d. pinched trail e. horizontal fold

‘Cold’ decorative techniques:-

- Horizontal wheel-cutting and abrasion are both formed by the use of a rotary stone or wheel with a cutting edge. The cutting ranges from light scratched lines to deep grooves depending on the time and pressure applied to the vessel whilst it is held at the wheel for cutting. Horizontal wheel-cut lines and abrasion are often found at the rim of the vessel and usually occur on vessels with cracked-off and polished rims (Fig.2.10.a).
- Facet-cutting is a more complex and deeper form of wheel-cutting. It is used almost exclusively on colourless vessels. Oval facets are positioned closely in lines, often interlocking with the line above to form a diamond lattice pattern. Occasionally facets are polished so that they merge together between rows in an irregular ‘jigsaw’ arrangement (Fig.2.10.b).
- Relief cutting again involves intense grinding and polishing of the surface of the vessel. Decorative elements are left standing proud of the surrounding area. These can be simple horizontal cordons (often seen above and below facet-cut zones), or more complex motifs such as flowers, tear-shaped features, shells and ovals. Both facet cutting and relief cutting have been noted on cast vessels, but are very much more common on beakers and bowls that have been blown as a blank and then decorated on the outer surface, leaving the inner surface glossy (Fig.2.10.c).

Fig.2.10 ‘Cold’ decorative techniques

2.6 Terms used to Describe Vessel Forms

2.6.1 Definition of General Form Categories

In any excavated assemblage of glass, the majority of the fragments cannot be assigned to a particular form. Whilst colour and method of manufacture are almost always discernible, the form of the vessel is often less obvious, unless diagnostic elements such as rims, handles and bases survive. In this thesis, a hierarchy of form identification commonly used amongst specialists in reporting ancient glass forms has been adopted. This consists of a series of divisions which allows vessels to be discussed in general terms, even when specific form types cannot be assigned. This hierarchy of identification begins with the simple division into whether a vessel might be classed as a tableware or a container, with further subdivisions of which the narrowest is specific form, often with a typological identifier such as an Isings number (Table 2.3).

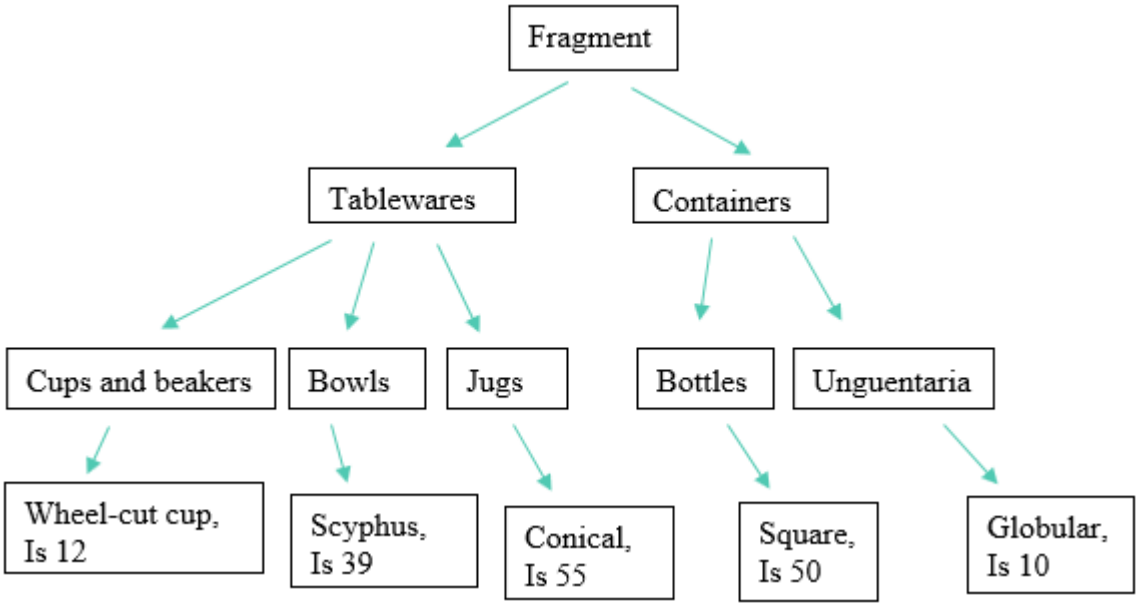


Table 2.3 Hierarchy of Identification with Isings form numbers (Is)

Any further refinement beyond this point usually centres upon decorative schemes, such as the 'Oliver' classification of colourless facet-cut beakers (Oliver 1984), or the division of mould-blown sports cups by mould-type (Sennequier et al. 1998). One further factor is often used to categorise glass - method of manufacture. This does not fit into the pattern described above, as it applies across general form groups – with bowls and cups in particular being produced by all techniques, blown, non-blown and mould-blown.

The general categories into which glass vessels are divided relate to their perceived function, with all complexities that come with modern assumptions as to their use. Only occasionally is glass function depicted in action, in rare wall-paintings, mosaics and funerary sculptures (Naumann-Steckner 1991; Chapter 8.3.2). Certain groups pose particular problems, namely jars, flasks and unguent bottles. Jars were produced in a range of shapes and sizes. Some are highly decorated with polychrome splashes and trails or tooled ribs and were most probably designed as tablewares. Mould-blown square jars (Fig.2.11.38) find their closest parallels in square bottles and are probably storage vessels. Other miniature jars (Fig.2.11.39) are likely to have been containers for cosmetics and oils. Flasks and unguent bottles also cover a broad spectrum of shapes and sizes. Small flasks may have been containers for oils and cosmetics, whilst larger versions would have been more general containers, perhaps even used at table. For the purposes of this thesis, the categories used will mirror those adopted by Cool and Price in their report on the Roman glass from Colchester (Cool and Price 1995, 8-9):

Drinking vessels, either cups (short) or beakers (tall); Bowls (low open vessels); Jugs (closed vessels with longer constricted necks and handles); Jars (closed vessels with shorter constricted necks); Bottles (closed vessels with short necks and handles).

In addition to these groups, flasks and unguent bottles will be defined on the basis of size, with flasks being classed as larger closed vessels with cylindrical necks and folded rims but no handles. Unguent bottles are closed vessels without handles in a variety of shapes, containing small quantities of liquids. Bath flasks are a separate specific form of spherical container with small looped handles.

2.6.2 Definition of Specific Forms

This section lists and describes the vessel forms that will be monitored in the dated groups selected for this study. They represent some of the more common forms present in glass assemblages of the mid-later 1st century. The purpose of bringing these vessels together is not to provide a comprehensive guide to Roman glass in the western provinces, but to list forms specific to this study. Whilst there are sometimes differences in the exact terminology across the corpus of glass forms of this period (for example whether a vessel is a cup or a bowl, a small flask or an unguent bottle), the level of inconsistency is not so great as to cause major issues. Where published material by other authors is used, care has been taken to establish exactly what shape and size of vessel is being discussed by a close reading of the catalogue and illustrations. For the purposes of data collection and presentation, the terminology used is derived from the author's own current practice which has evolved through reference to numerous publications, of which the following are the more significant:-

- The comprehensive review of glass forms in the western provinces based upon dated finds published by Clasina Isings (Isings 1957)
- The report on the large group of glass excavated at various sites in Colchester between 1971 and 1985 (Cool and Price 1995). The authors present an overview of glass going in and out of use throughout the lifetime of the Roman city, from the 1st to the 4th centuries (Cool and Price 1995, 211-23).
- The "Handbook of Romano-British Glass Vessels", based upon complete and fragmentary examples from dated contexts (Price and Cottam 1998).
- The report on the glass from Augst and Kaiseraugst, Switzerland (Augusta Raurica) and the associated index of form types (Rütti 1991). This typology is widely used by researchers in continental Europe. Some identified forms are derived from whole vessels, though many are based upon more fragmentary evidence.
- The review of glass forms occurring in Southern France by Danièle Foy and Marie-Dominique Nenna (Foy and Nenna 2003), largely based upon dated funerary groups.

The most influential glass typology remains that of Clasina Isings and the form numbers established by her will be used as the principal reference. The numbered list below is not intended to form a system or typology and functions purely as shorthand for use within this particular piece of work. A description of each form is given in Appendix 1.

2.6.3 Non-blown Cups and Bowls

1. Cup with a double curved profile and low base ring (Isings form 2), Fig.2.11.1.
2. Bowl with double curved profile, flat base and low base ring, Fig.2.11.2.
3. Bowl with cylindrical side and flat base (Isings forms 22-3), Fig.2.11.3a and b
4. Convex bowl with no base ring (Isings form 1/18), Fig.2.11.4 a and b
5. Small convex bowl with base ring (Isings form 20) Fig.2.11.5
6. Shallow bowl with a slightly convex body, flat base and low base ring (Isings form 5), Fig.2.11.6
7. Ribbed bowl (Isings form 3) Fig.2.11.7a and b
8. Scyphus, Fig.2.11.8
9. Plate/bowl with wide rim, often with overhanging edge Fig.2.11.9
10. Shallow convex bowl without base ring Fig.2.11.10

2.6.4 Mould-blown Cups, Beakers and Bowls

1. Sports cup, Fig.2.11.11
2. Conical beaker with motifs, (Isings form 31) Fig.2.11.12
3. Cylindrical cup, Fig.2.11.13
4. Ovoid cup, Fig.2.11.14
5. Ribbed cup/bowl, Fig.2.11.15

2.6.5 Blown Cups and Beakers

1. Wheel-cut cup (Isings form 12), Fig.2.11.16
2. Wheel-cut beaker on solid base (Isings form 34), Fig.2.11.17
3. Wheel-cut beaker with small tubular base Fig.2.11.18
4. Facet-cut or relief-cut beaker Fig.2.11.19

5. Indented beaker (Isings form 32 and 34), Fig.2.11.20
6. Arcaded/trailed beaker, Fig.2.11.21

2.6.6 Blown bowls

1. Small bowl with curved rim and pinched ribs (Isings form 17), Fig.2.11.22
2. Tubular rim bowl (Isings form 44 and 45), Fig.2.11.23a and b
3. Convex bowl with rounded rim (Isings form 42), Fig.2.11.24
4. Cylindrical bowl with rounded rim (Isings form 41), Fig.2.11.25
5. Conical bowl with rounded rim (Isings form 43), Fig.2.11.26
6. Cantharus (Isings forms 36, 38), Fig.2.11.27
7. Modiolus (Isings form 37), Fig.2.11.28
8. Scyphus (Isings form 39), Fig.2.11.29

2.6.7 Jugs and Amphorisks

1. Conical jug (Isings form 55), Fig.2.11.30
2. Globular jug (Isings form 52b), fig 2.11.31
3. Short necked globular jug (Isings form 57), Fig.2.11.32
4. Biconical/ovoid jug (Isings form 13), Fig.2.11.33
5. Jug with spout (Isings form 56), Fig.2.11.34
6. Amphorisk (Isings form 15), Fig.2.11.35

2.6.8 Jars

1. Jar with collar rim (Isings form 67), Fig.2.11.36
2. Convex jar, Fig.2.11.37
3. Square jar (Isings form 62), Fig.2.11.38
4. Miniature jar (Isings form 68), Fig.2.11.39

2.6.9 Flasks and Unguent bottles

1. Ovoid flask (Isings form 16), Fig.2.11.40
2. Bath flask (Isings form 61), Fig.2.11.41
3. Piriform/globular unguent bottles (Isings forms 6, 26, 28a), Fig.2.11.42
4. Conical unguent bottle (Isings form 28b), Fig.2.11.43

5. Tubular unguent bottle (Isings form 8 and 27), Fig.2.11.44
6. Spherical unguent bottle (Isings form 10), Fig.2.11.45
7. Bird-shaped unguentaria (Isings form 11), Fig.2.11.46

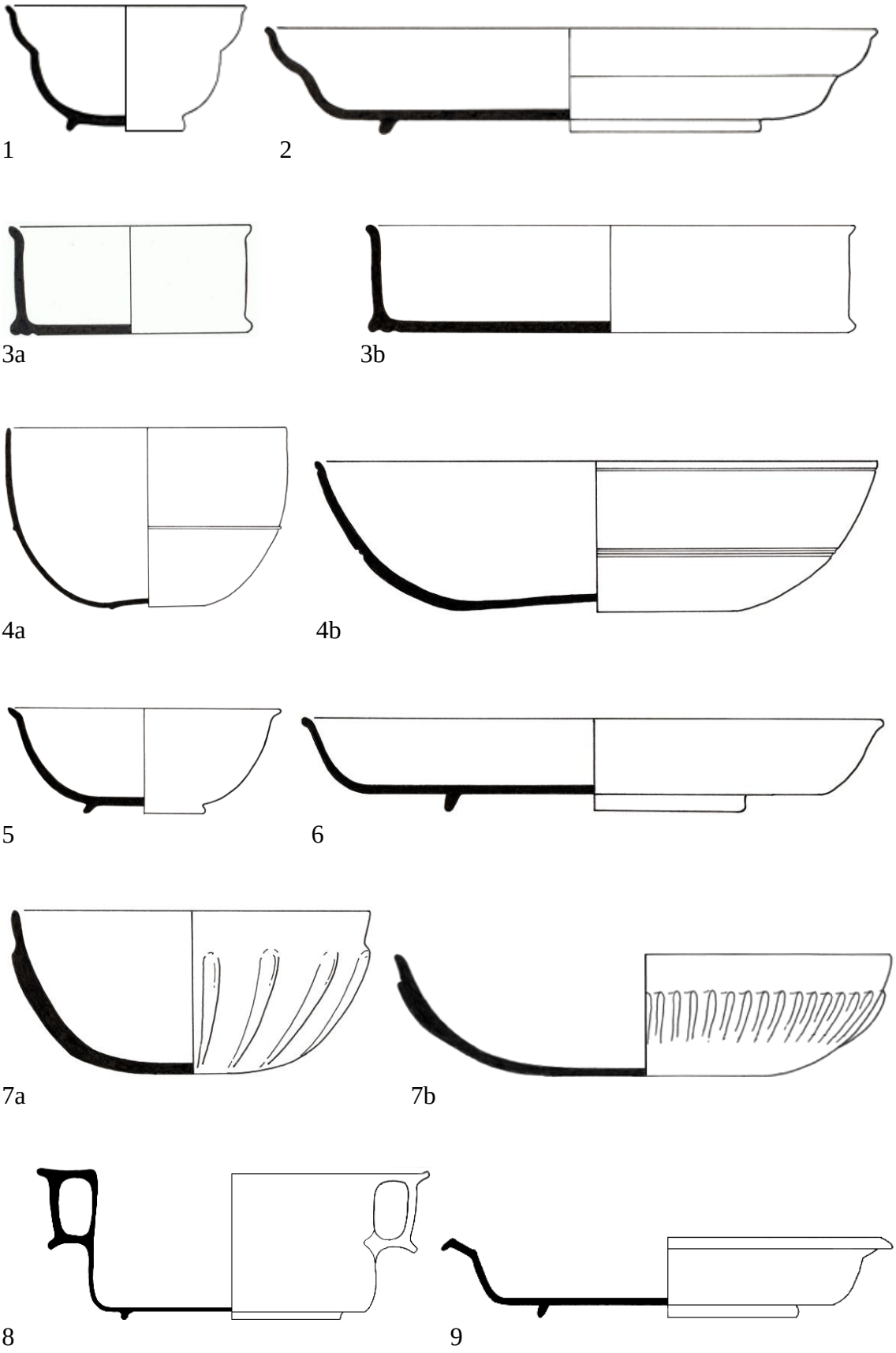
2.6.10 Bottles

1. Square bottle (Isings form 50), Fig.2.11.47
2. Hexagonal bottle, Fig.2.11.48
3. Cylindrical bottle (Isings form 51), Fig.2.11.49

2.7 Summary

This chapter has illustrated the general trends that characterise glass vessels at the point at which the accumulation of data for this thesis begins. In reviewing some typical assemblages of the second quarter of the 1st century in areas of the western empire where glass use was prevalent, it has been possible to distill those features that define the industry of the period. These have been listed to provide clarity in the chapters ahead. The inventory of forms covers main types encountered. Forms that either stand alone without known parallel, or are found very infequently, have not been included in this study.

The next task is to construct a chronological framework for data collection. This will involve the selection of glass assemblages considered to be sufficiently closely dated to be valid as a means of assessing the progression of the characteristics identified above with the best possible resolution.



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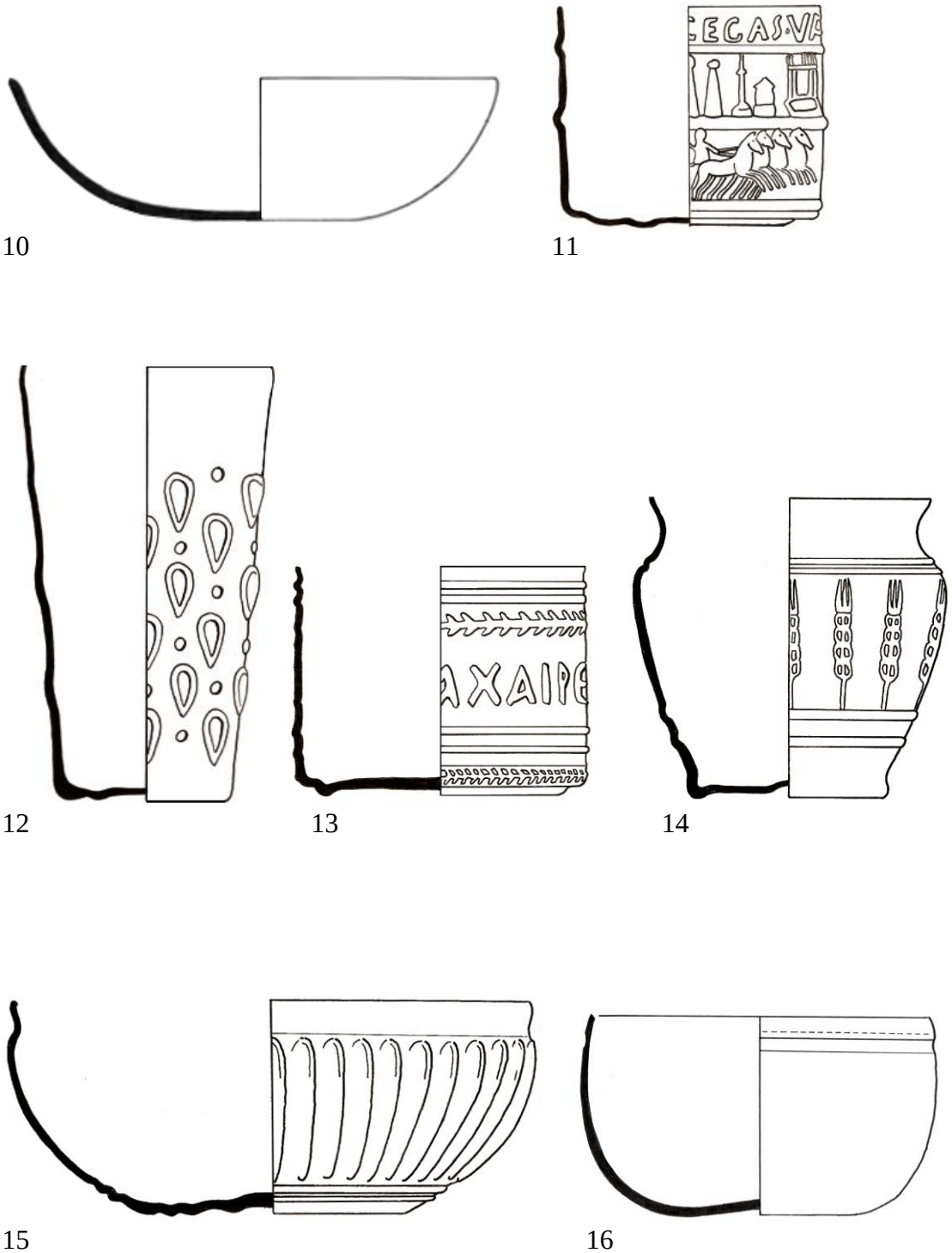

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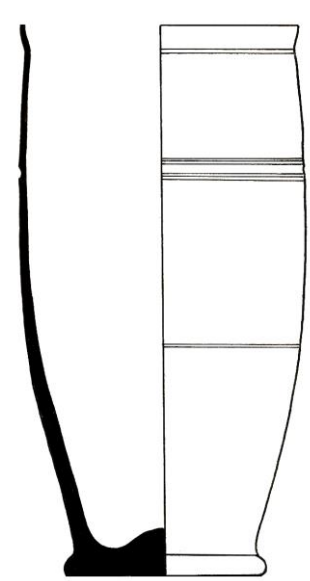

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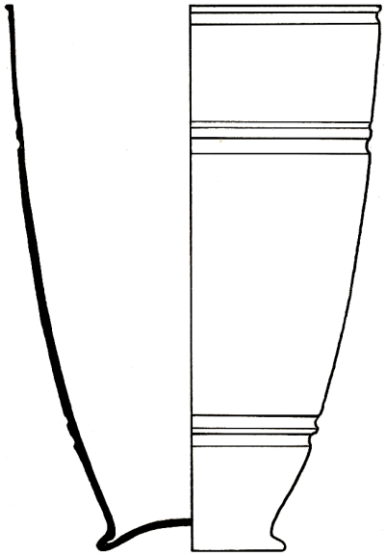

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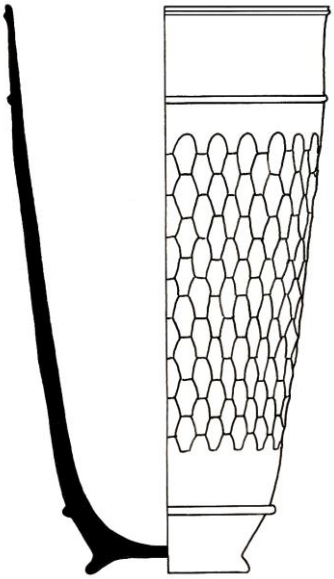

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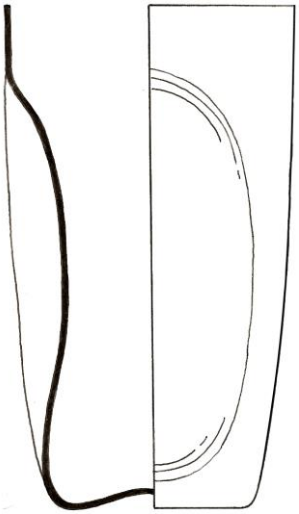

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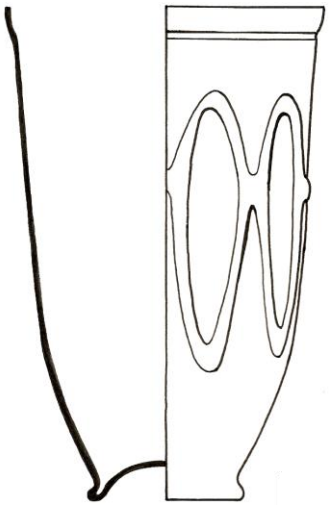

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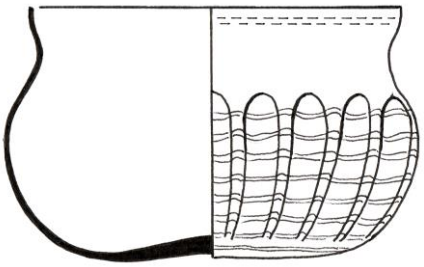

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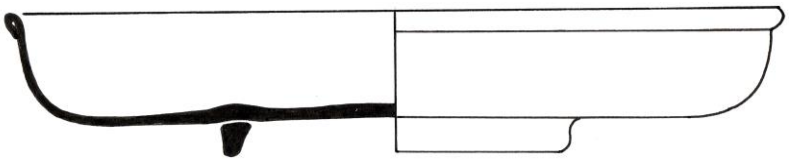

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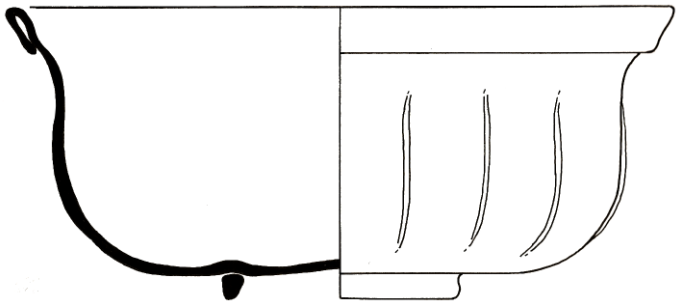

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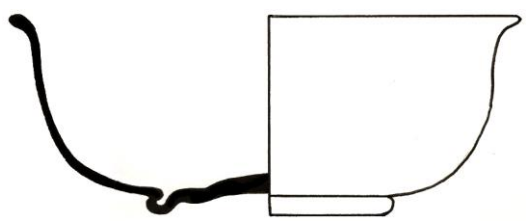

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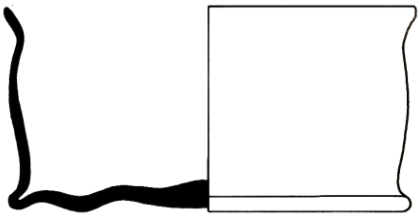

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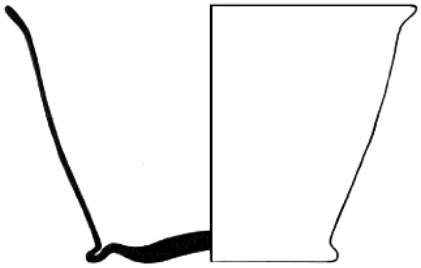

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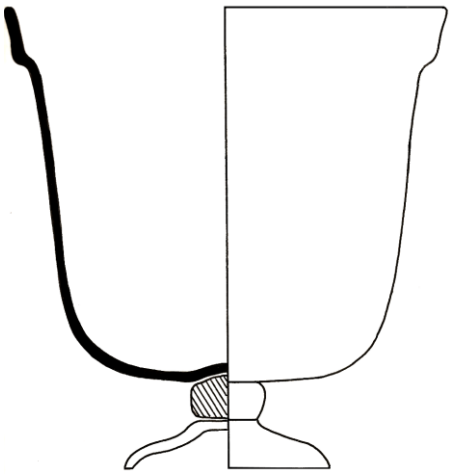

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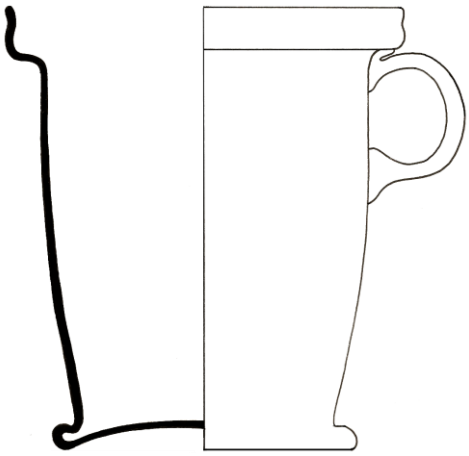

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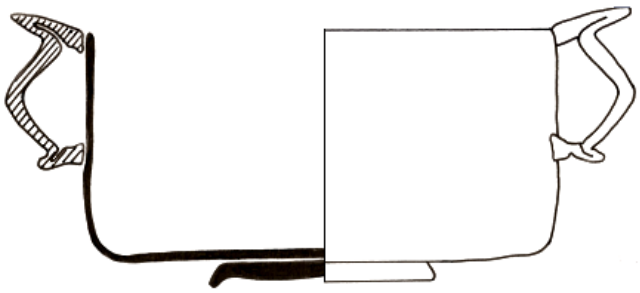

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Fig.2.11 © S.Cottam

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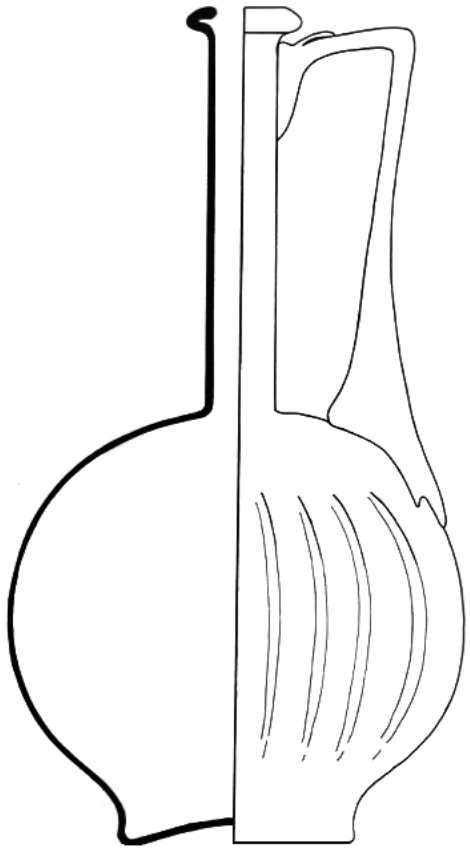

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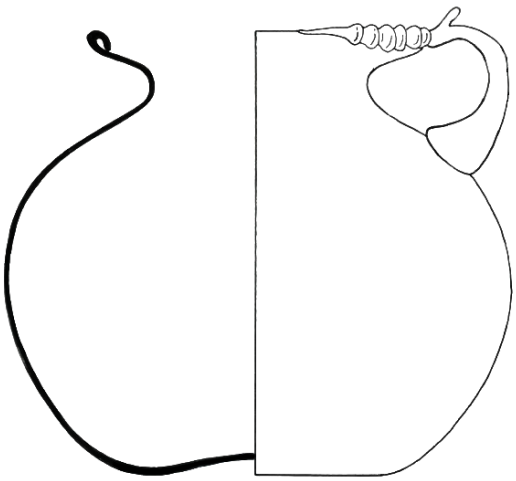

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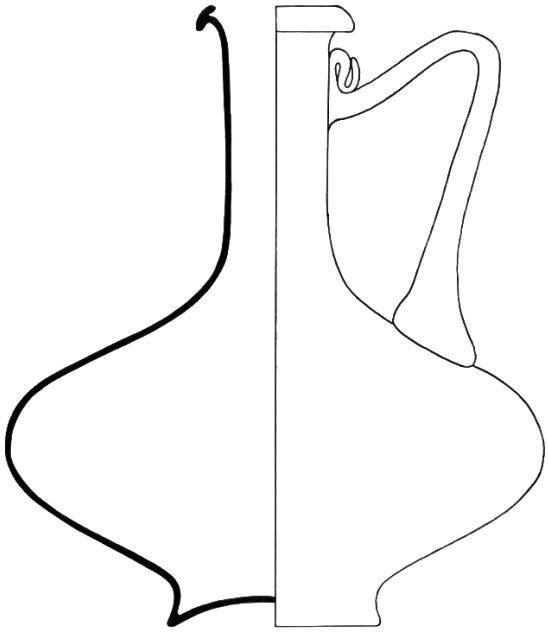

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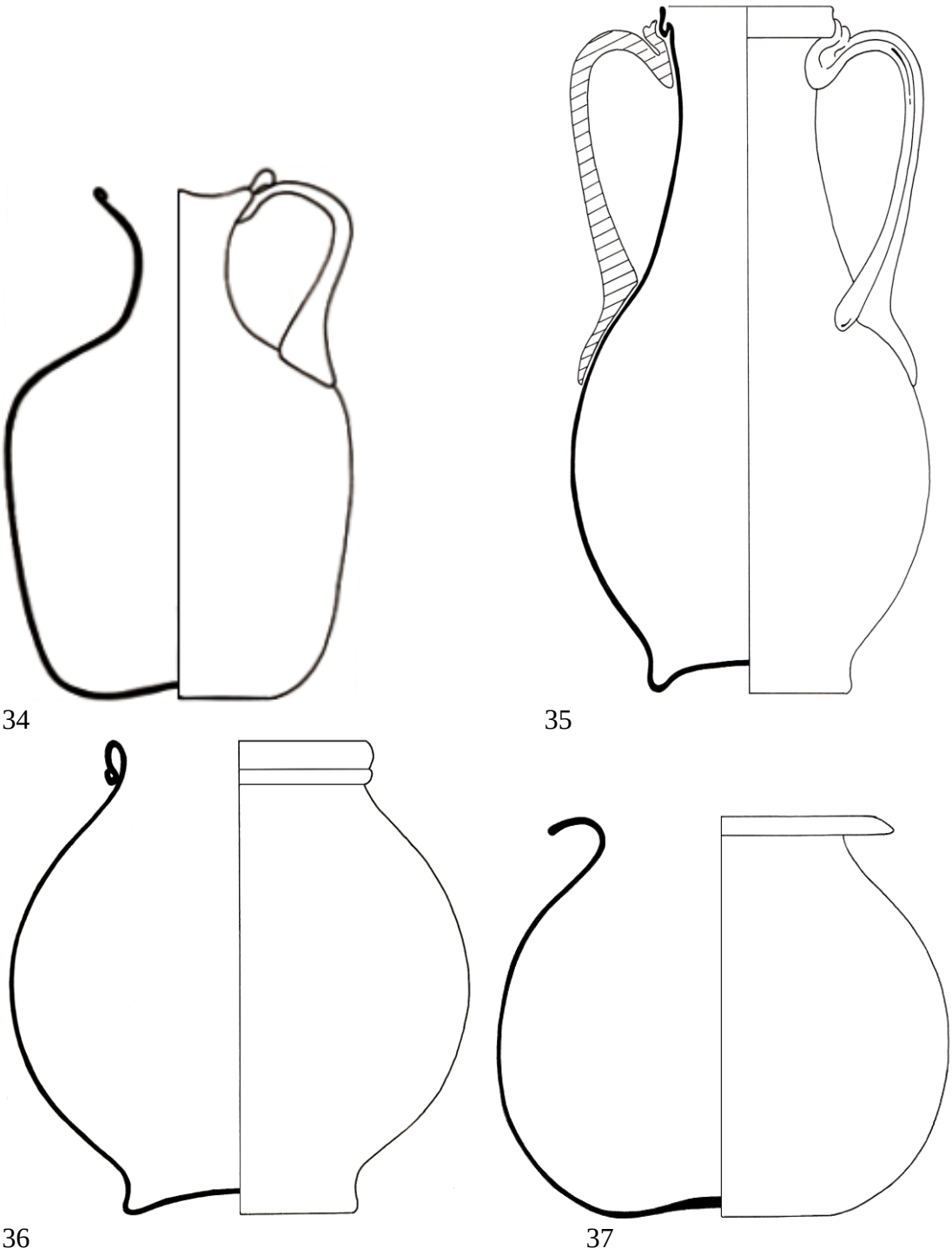

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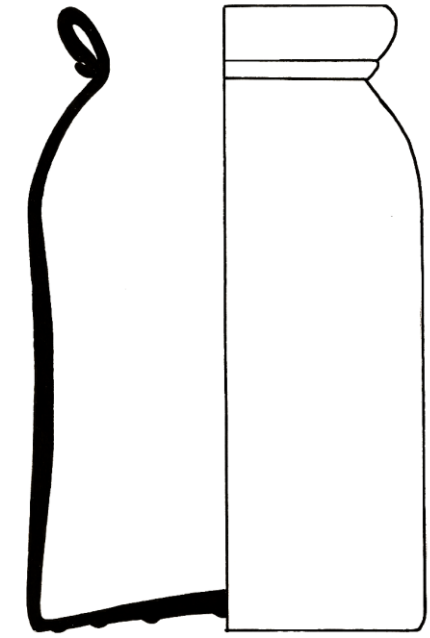

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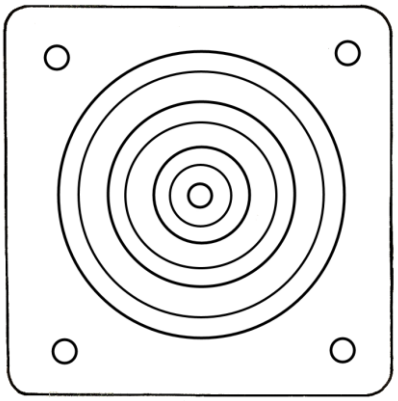

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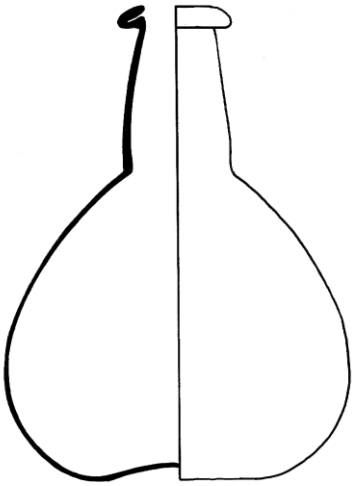

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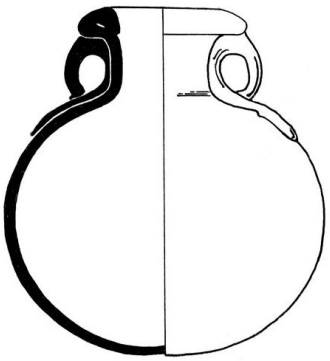

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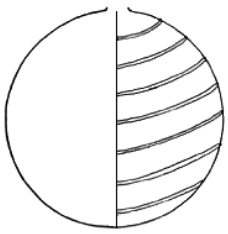

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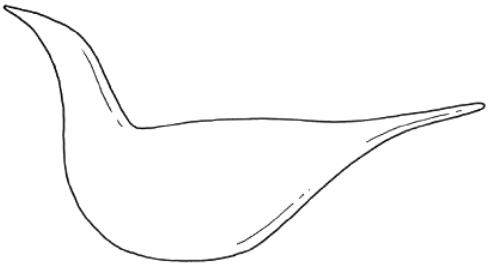

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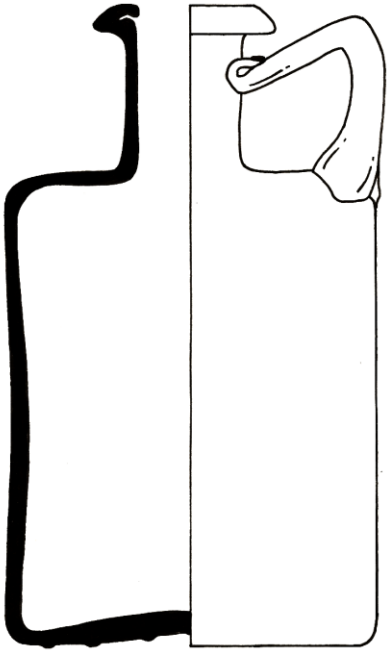

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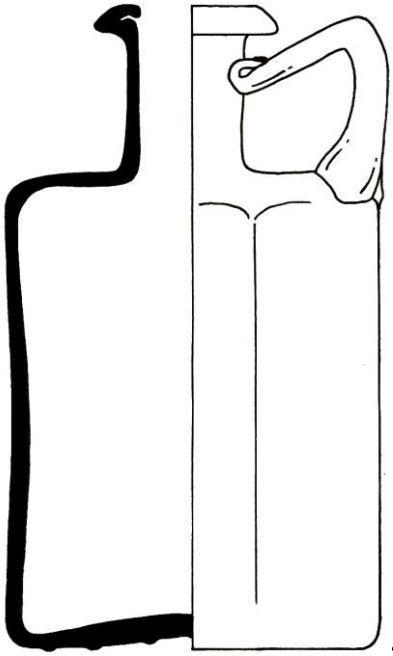

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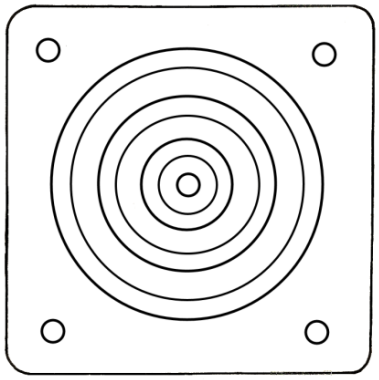

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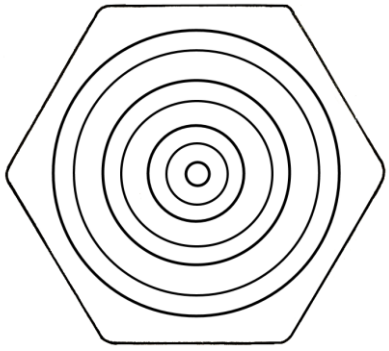

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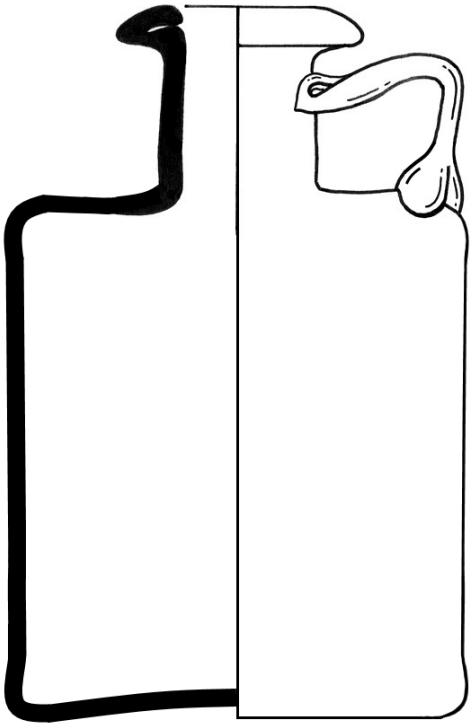

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Chapter Three
Identifying Suitable Assemblages for Study: Questions Concerning Dating, Deposition and Quantification

3.1 Introduction

The success of this project depends on the selection of appropriate assemblages to provide consistent and dependable data that can withstand close scrutiny. A priority in the preparation of this thesis was to bring together assemblages from a wide geographical area, regardless of size, rather than concentrating on a limited number of larger groups (Section 3.3). As will be seen in this chapter, there is considerable variation in the types of site providing data, a variation which, it is believed, will enhance the study by demonstrating common trends in glass use, rather than site-specific tendencies. The other main consideration in the selection of assemblages for examination centred upon the precision with which the glass could be independently dated. The assessment of the relative value of each of the groups in this respect relies on a number of factors, including the nature of the site, the circumstances of deposition, the extent of the excavations, and the quality of data recovery and recording during and after excavation. This chapter will discuss these issues and summarise the sites selected for examination.

3.2 Dating archaeological glass

3.2.1 Using established typologies

The dating of archaeological objects is a complex and challenging operation. Glass can be regarded as one of the more difficult artefact categories to approach. In itself it can give no absolute dates. Glass and glassy materials have so far proved resistant to being dated with any precision using scientific techniques. Very rarely is the iconography of figurative decoration of any assistance, as discussions over the date of the British Museum's 'Portland Vase' clearly demonstrate (Roberts et al. 2010, 36-43), nor do

epigraphic references provide accurate dating. For Roman glass, typological analysis is the bedrock of standard dating, and there are a number of typologies in existence that might be drawn upon in a review of changes in the glass over the course of the Roman period. The classification of Roman glass by Clasina Isings, published over sixty years ago, is still frequently cited as a shorthand reference for many of the more common glass forms (Isings 1957). It has distinct advantages over some other more recent classifications in that it draws upon the evidence of complete vessels from dated contexts from many different sites. The drawback in using it to chart subtle changes in the form and decoration of glassware lies in its heavy reliance on glass from burials, which can be difficult to date with precision. A further disadvantage lies in the scope of the material on which the study drew. Isings' access to museums was restricted in the immediate post-war period, and few published glass reports and catalogues were available. Material from Britain and the Iberian peninsula was largely ignored. The book's illustrations are intended only as a very basic guide to form and give little or no indication of decoration.

Other commonly used systems include the 'AR' sequence, derived from the report on the glass from Augst, Switzerland (Augusta Raurica) and its associated index of form types (Rütti 1991). This typology is widely used by researchers in continental Europe. Some identified forms are derived from whole vessels, but many are only based upon fragmentary evidence, which makes it an incomplete tool for vessel identification. The other main disadvantage of the 'AR' system is that it was never devised as a universal typology with associated dating, but was constructed as an aid to interpreting the glass from a single site.

The fifty to sixty years covered by this piece of research is, from an archaeological perspective, a short period of time. The established typologies rarely narrow down the general production span of individual vessel forms to periods of thirty years or less. As the emphasis here is upon refining vessel dating then the analysis of assemblages from tightly dated contexts will form the basis of establishing chronology, rather than reference to existing typologies.

3.2.2 Factors governing the dating of archaeological glass

There are numerous factors that influence the dating of glass vessels as well as other artefacts from archaeological contexts, but some of the particular points relevant to establishing a refined chronology for the data-set used in this thesis will be summarised here.

Since the material itself cannot be independently dated, the date of the deposit is key, but even when specific contexts can be dated precisely, there are conditions relating to the way glass was acquired, used and deposited that should be considered. The length of time a vessel is used before being discarded is difficult to gauge, as some may have more complex object biographies. The physical durability of the vessel – its ability to remain intact – may also see sturdier vessels such as bottles last longer than more delicate tablewares. Issues concerning patterns of glass supply to sites also need to be considered. The proximity of sites to glass production areas is likely to have a notable influence on the quantity and type of glass available to the inhabitants. Military sites in northern England and Scotland for example, several of which are included in the dataset, will not have had easy access to the full range of glass forms available to the citizens of Italian cities, for example. The quantity of glass transported in a military campaign may have been limited and new glass vessels less easily acquired.

The other factors in establishing the lifetime of individual vessels relate to their fate once deposited. Sites that have had continuous intense occupation since the Roman period, (such as the many urban sites in this study, notably London) and where deposited layers have been re-cut are at particular risk of producing residual fragments. When a sudden destructive event takes place (as seen at many sites in this study as Colchester, London, Pompeii and Cremona) large quantities of glass vessels can be destroyed within a very narrow period of time, their normal lifespan being cut short. This inevitably distorts the profile of an assemblage and such horizons need to be understood for their impact on vessel quantification as well as their contribution to the chronology of individual forms.

In certain circumstances, rare outside of funerary contexts, individual vessels are recovered from archaeological deposits largely intact (see for example the Barzan well deposit, Chapter 4 band G). The reasons for these patterns of disposal are not always

apparent; it is possible that the broken vessels were of little further value and simply needed to be quickly cleared away. Another possibility is that the vessels were deliberately placed intact or largely complete in a structured deposit that held further meaning beyond their function as tableware or storage vessels. There are many ways to approach the interpretation of these groups, from seeing them as highly symbolic or the product of a more banal episode (see for example Hill 1995; Chadwick 2012). There is then a danger that these are selected groups rather than representative of everyday use. These deposits need to be analysed with care before being used in a study of this kind. Interpreting glass from burials presents particular difficulties as there is always a risk that funerary glass is old when deposited. For this reason, given that the issue of accurate dating lies at the heart of this study, glass vessels from burials have not been included here.

3.2.3 The impact of re-cycling

After breakage, small glass fragments are generally dispersed and consequently most glass vessels are identified from single, or very small groups of fragments. Recovery of the full range of glass in use at any site is never possible given the constraints of excavation, and it is further impeded by the high probability that fragments were collected as cullet for re-melting, to produce new vessels or windows. No calculation is possible as to the amount of glass collected in this way, but evidence that the practice took place is provided by the large assemblages of fragments found at a number of furnace sites, for example at Basinghall Street in London (Shepherd and Wardle 2009), and as cargo, as in 2nd-3rd century wreck of the *Iulia Felix* which sank in the northern Adriatic whilst transporting a barrel full of broken glass (Silvestri, Molin and Salviulo 2008; Freestone 2015, 29-34). The systems in place for the recovery of broken glass for reuse probably differed considerably from one site to another, depending on the proximity of glassmakers and the value to be gained from collection. Brief references by Martial (*Epigrams* I, 41) and Statius (*Silvae* I, 6) suggest that in Rome at least such fragments had a limited individual commercial value, but that nonetheless the trade existed and presumably was considered worthwhile. In other parts of the Roman world, the value of glass cullet may have been very different, particularly where raw glass from primary sources was less available. Strongly coloured glass fragments, such as dark blue, dark green and purple may have had a special value as recycled items. Price suggests, in connection with her

work on the glass from the fortress at Usk, that this may have had an impact on the occurrence of these colours in Roman Britain and notes that 'the comparative rarity of brightly coloured monochrome pillar-moulded bowls at Usk and other Claudian-early Flavian sites in Britain may indicate that the broken fragments were recognized as a source of material for the production of other vessels or objects such as bangles and beads, and were carefully collected for recycling' (Price 1995, 146). Evidence of recycling of strong Roman colours has also been proposed in the manufacture of certain classes of Iron-Age beads in Scotland (Bertini et al. 2011, 2765).

3.3 Selecting Assemblages for Study

The success of this research rests on the ability to date with precision when changes in the appearance of glass vessels occurred in the period c.A.D.50-c.A.D.100. It is considered possible to achieve this aim by selecting for study assemblages reliably dated to the narrowest possible periods of deposition. The manner in which many deposits from the mid-later 1st century were formed gives considerable assistance in this task. This period witnessed a series of military events, political upheavals and one extraordinary environmental catastrophe (the eruption of Vesuvius) which assist in the dating of sites and contexts (Section 3.2.2). The 1st century A.D. was a period of intense military activity in the western provinces, notably the invasion of Britain, and adjustments on the Rhine frontier. Added to this are the disturbances resulting from the civil wars of A.D.69, in particular the destruction of the town of Cremona and the Batavian revolt on the northern *limes*. Later in the century, the movement of military detachments in northern England and Scotland, and the establishment of forts can be dated with some precision, in part because of the accuracy of tree-ring evidence (as at Carlisle) as well as the short-lived character of some of the sites.

The selection of sites considered worth examining is based upon a number of factors. The stratigraphic sequence must be clearly defined and closely dated. Sites presenting sequences of narrowly dated periods and phases are particularly worthwhile to study. There is additional value to be had from sites which provide information on the social context of vessel use. The study of the large assemblage of glass from Vindonissa (Berger 1960) provided a particular inspiration for this thesis in that it was one of the earliest

projects to identify some of the developments in glass in the later 1st century by the comparison of differently dated deposits across the site (1.1.2). However, the assemblage has not been included in the dataset here because of the differing opinions by scholars over the date of the division between the east and west Schutthügel (Fellmann 2009).

For the purposes of this thesis is was felt that a large volume of material should be studied to counteract some of the inevitable difficulties that occur in attempting to reconcile data from sites with disparate histories of occupation and use. However, the very large number of fragments required for the study presented a potential challenge to the time and resources available and so the following guidelines were adopted.

As many assemblages as possible were assessed at first hand. For unpublished material this was essential. Consequently, fragments from many of the sites were viewed at first hand. Where original material was examined, this is noted in the inventory. In these circumstances, vessels could be correctly and consistently recorded and accurate drawings and photographs made. Where time constraints or museum closures made first-hand recording impossible, published reports of the material were used. Familiarity with the work of many specialists in Roman glass meant that a view could be taken on the accuracy of information from published material. A number of specialists provided particularly well-researched and illustrated reports that were considered to be highly reliable as sources of data for this project. The following section sets out an inventory of sites selected for examination.

3.4 Italian sites

Cremona

Site/area: Piazza Marconi
Size of assemblage:536
Publication: Arslan-Pitcher 2018
Original material examined at the Soprintendenza Archeologia, Milan

The town of Cremona on the river Po in Lombardy, is recorded as being founded as a Roman colony in 218 B.C (Polybius *Histories* 3.40). According to Tacitus, the town was sacked and largely burned down in the last week of October A.D.69 after the second battle

of Bedriacum, by victorious troops fighting in support of the imperial claim of Vespasian (*Tac. Hist.* III, 32-4). Recent excavations (2005-7) at the Piazza Marconi, to the south of the centre of the old city, have uncovered a large townhouse with polychrome mosaic pavements, marble statuary and other prestigious items which seems almost certainly to have been destroyed in this event (Arslan Pitcher 2018). Soon after, the area was revisited and large regular pits dug into the destruction layer. These were then filled with material from the burnt deposits, including a considerable amount of glass, much of it melted. The glass can therefore be confidently dated to the period immediately preceding A.D.69.

Pompeii

Site/area: *Regio I*
Size of assemblage:949
Publication: Scatozza-Höricht 2012

Large quantities of glass have been recorded from this town destroyed in the Vesuvian eruption of A.D.79 (Beretta M and di Pasquale, 2004; Scatozza-Höricht 2012). Early exploration of the ruins, particularly in the 18th and early 19th centuries, concentrated on exposing the remains and recovering complete items. From the mid-19th century onwards, under the direction of Giuseppe Fiorelli and his successors, there was a more organised system of recovery and field diaries of finds were kept, giving better contextual information. More recent excavations have expanded the research agenda to examine the life of the town in the centuries before its destruction, but for thesis, only complete or nearly complete glass vessels in use in the period immediately prior to A.D.79 were studied.

3.5 Gallo-Roman Sites

Lyon

Site/area: *Rue Bourgelat*
Size of assemblage:622
Publication: Robin 2012a and 2012b
Original material seen at the Depot of the Service Archéologique de la Ville de Lyon

The Rue Bourgelat site lies on the neck of land between the rivers Rhône and Saône. Excavations by the Service Archéologique de la Ville de Lyon ahead of re-development in 2010 revealed a sequence of well-dated deposits from the middle of the 1st century

A.D. onwards (Bertrand 2011, 44-48). Early on in this sequence, a wall was constructed across the area, against which a series of layers accumulated, building up to form a platform, sealed by a demolition layer of burnt clay. These layers contained a wealth of finds, including ceramics, coins and painted plaster. The site was thought to lie in an area of relatively wealthy urban housing. The coin assemblage was predominantly Tiberian-Claudian and no Neronian issues were identified. The glass assemblage was dated to the late Claudian/very early Neronian period.

Barzan

Site/area: Well deposit PT25055
Size of assemblage:370
Publication: Cottam 2011
Original material examined for preparation of publication (Cottam 2011)

The remains of a large Roman town near the village of Barzan (Charente-Maritime) on the north shore of the Gironde estuary in south western France have been excavated by several teams at various points since the 1920s (Bouet 2011, 23-31). The glass being examined here comes from a single deposit, a 20 metre deep stone-lined well (Cottam 2011) in an area of public and private buildings situated between a Gallo-Roman sanctuary and the site of a large 2nd century A.D. public bathhouse. This is a self-contained and clearly delineated feature that produced a closely dateable set of artefacts, including ceramics and coins. The latest coins come from the last decade of the 1st century A.D, whilst the ceramics point to a date in the 1st quarter of the 2nd century. Many of the glass vessels and the ceramics survive in substantial portions. Parts of the same vessels have been found in different layers of the well deposit, suggesting that the well was filled rapidly. The deposition is therefore thought to be the result of a single event and is dated to c.A.D.110 (Bouet 2011, 202-8).

Eysses

Site/area: Cantegrel
Size of assemblage:499
Publication: Chabrié 2010
Original material examined at the Musée Archéologique d'Eysses, Villeneuve-sur-Lot

The town of Eysses (Lot-et-Garonne) has been the subject of archaeological investigations since the 1970s, with the involvement of a local archaeological group and,

more recently, a team from the University of Toulouse. Eysses is believed to correspond to the roadside settlement of *Excisum*, noted on the Antonine itinerary and on the Peutinger map (Chabrié, Daynès and Garnier 2010, 7). A number of structures dating from the 1st century A.D. to the late Roman period, including private residences, baths, a possible temple, basilica, shops and workshops have been identified. The discovery of three funerary inscriptions relating to auxiliary soldiers and a number of finds which might be interpreted as being connected with military activity have prompted the suggestion that a unit was stationed here sometime in the early decades of the 1st century A.D. (Chabrié, Daynès and Garnier 2010, 11-14). The most recent work at the site investigated the Cantegrel area of the town. Here a number of pits and wells were excavated, as well as a dump of black and ashy earth containing a large quantity of construction material, workshop debris, ceramics, glass and other items. The excavators believe this dump to have been formed within a very short period of time. The date of deposition of the dump, based upon the coinage, the ceramics and small finds, has been placed between A.D.65-72 (Chabrié, Daynès and Garnier 2010, 214).

3.6 Military sites associated with the German Limes

A century or more of excavations at Roman fortifications associated with the German *limes* has produced considerable quantities of Roman glass. Amongst the best known are vessels from the legionary base and *colonia* at Cologne, published in numerous catalogues and articles by Fremersdorf and others. Much of this glass, as with vessels from the legionary base at Bonn (Follmann-Schulz 1988), comes from burial deposits and is therefore not tightly dated. More useful to this study are the destruction contexts believed to be associated with the Batavian revolt of A.D.69/70, identified at several sites in the lower Rhineland. In some cases, direct links with the account of the uprising (*Tac. Hist.* IV 12-37, V 14-26) and individual locations have been made. At some sites, such as Nijmegen and Moers-Asberg (*Asciburgium*) the interpretation of troop movements has also been used to date periods of occupation. The well-structured and comprehensive catalogues of Isings and van Lith on glass from Nijmegen, Velsen, Valkenburg and Moers-Asberg are of particular value.

Valkenburg, Netherlands

Site/area: Fort and civilian settlement
Size of assemblage:81
Publication: van Lith 1978-9; Sablerolles 1996

The fort at Valkenburg, near the mouth of one of the branches of the Rhine, was founded in A.D.39/40 (van Dierendonck, Hallewas and Waugh, 1993). The site was extensively excavated from the 1940s to the early 60s (Glasbergen 1967) and again in the 1980s (van Dierendonck, Hallewas and Waugh, 1993). A layer of destruction clearly visible in the stratigraphy (Glasbergen 1967, 45 Fig.21) has been associated with destruction during the Batavian revolt of A.D.69/70. A report on the glass from the earlier excavations includes diagnostic fragments (van Lith 1978-9), and there is a further article on glass from later excavations in the fort and civilian settlement (Sablerolles 1996).

Nijmegen, Netherlands

Site/area: Kops Plateau fortress and canabae legionis of the Hunerberg fortress
Size of assemblages: Fortress – 131. Canabae legionis - c.2,200
Publication: Fortress - Isings 1968; van Lith 2006 and 2009. Canabae legionis - Isings 1980

Six Roman period settlements lie in and around the modern city of Nijmegen (van Enckevort, Haalebos and Thijssen, 2000). The first fortress dates to the Augustan period (the Hunerberg), and after a period of abandonment was re-occupied after A.D.70 by legionary forces. The fort on the Kops Plateau, also an Augustan foundation, was in use during much of the 1st century A.D., and its abandonment in around A.D.70 has been associated with the events of the Batavian revolt. Alongside the military activity, a civilian settlement, *Batavodurum*, was also occupied until being destroyed by fire in the third quarter of the 1st century A.D., an event also attributed to the Batavian revolt. A new civilian foundation, Noviomagus, just south of the river Waal, was established after the revolt (Willems and van Enckevort, 2009). Two assemblages have been included in the data. The first has glass from the occupation of the Kops Plateau fort up to A.D.69/70 and the second has glass from pits in the *canabae legionis* of the Hunerberg fortress (Bloemers 1980). As a result of the events of A.D.69/70, the Kops Plateau fort provides a clear dated destruction horizon, whilst the departure of *Legio X Gemina* (c.A.D.103) from the Hunerberg fortress provides another, though less clear cut, phase of abandonment.

Xanten (Vetera), Germany

Site/area: Vetera I
Size of assemblage:355
Publication: Hanel 1995

The earliest legionary fortress at Xanten (Vetera I) was founded in the Augustan period and occupied and rebuilt through to the end of the reign of Nero. The fortress was destroyed in the Batavian revolt of A.D. 69/70 and was not re-occupied. A new fortress, Vetera II was constructed nearby after A.D.70, but has not been excavated. The associated civilian settlement has also produced a layer of burning dated to around the same period and it is assumed to have been destroyed during the same conflict. A phase of rebuilding has been recorded soon after these events. As with the military and civilian installations at Nijmegen, these destruction levels provide an accurate end-date for the pre-Flavian glass assemblage.

Moers-Asberg (Asciburgium), Germany

Site/area: Kastell IV
Size of assemblage:14
Publication: van Lith 1987

An auxiliary fort was established on the left bank of the Rhine between Cologne and Xanten in the Augustan period and now lies under the modern suburb of Moers-Asberg in Germany. The fort is recorded by Tacitus as being attacked during the Batavian revolt of A.D.69/70 (*Tac. Hist*. 4, 33). It was rebuilt, but seems to have only lasted until c.A.D.82 when the unit was withdrawn, though a civilian settlement continued to be occupied (Bechert 1989). Whilst there is no accurate end date for the assemblage from Kastell IV, it has been dated to the Claudian/Neronian phases of occupation.

Velsen II, Netherlands

Site/area: Contexts from across the fort
Size of assemblage: 26
Publication: van Lith 1977; Bosman and de Weerd 2004

Velsen lies on the northern edge of what was once the most northerly of the navigable channels of the Rhine but is now on the channel leading from Amsterdam to the North Sea. Throughout their lifetime, the forts at Velsen were at the very edge of the official Roman world. Set about a kilometre apart, the relationship between the two is unclear,

and they may have formed part of the same military complex (Bosman and de Weerd 2004). Velsen II was in use for just a short period from c.A.D.40, and may have ceased by A.D.43, and very probably by A.D.47. It provides a small but tightly dated assemblage that complements the finds from the earliest sites in Britain.

3.7 Romano-British sites

3.7.1 Post-conquest forts in south-western England

In the years following the invasion of A.D.43, a number of military sites, often in strategic hilltop locations, were established in south-western England. Several of these were only briefly occupied, and therefore provide small but quite closely dated artefact assemblages. Others are not as precisely dated, but do have a secure *terminus post quem* of A.D.43. Assemblages from those sites occupied in the pre-Roman period might potentially include earlier vessels. However, given the lack of glass vessels from late Iron Age sites with no subsequent Roman occupation, this is unlikely.

Lake Farm, Dorset

Site/area: Contexts from across the military base
Size of assemblage:155
Publication: Unpublished
Original material examined at the Romano-British Glass Project, Durham University

The role of this military base is uncertain, as although there have been several small excavations at the site since the late 1950s, no large-scale investigation has taken place. The site has been interpreted as a temporary camp succeeded by a more permanent fort or vexillation fortress, perhaps a supply depot. One main structural phase has been identified but no detailed plan of the internal arrangements is possible. An exact chronology has yet to be published, but when first reviewed the samian pottery suggested occupation from c. A.D.44 to the mid-A.D.60s (English Heritage PastScape website page for Lake Farm[3]).

[3] http://www.pastscape.org.uk/hob.aspx?hob_id=457187

Hod Hill, Dorset

Site/area: Fieldwalking finds and contexts from across the fort
Size of assemblage: 49
Publication: Harden 1968a, Price 2005b

Hod Hill, about 18 miles north-west of Poole in Dorset, is the site of a large Iron-Age hillfort with substantial ditch and rampart defences. The Roman fort was constructed in the north-western corner of the original hillfort, re-using part of its defences. The site was excavated in the 1950s by Sir Ian Richmond who proposed that the fort was built very soon after the Claudian invasion of Britain and probably occupied until the early A.D.50s (Richmond 1968, 117-123). The exact nature of the garrison is uncertain, but on the basis of recovered finds interpreted as legionary and cavalry equipment, a legionary vexillation and cavalry detachment presence has been proposed (Maxfield 1986, 65).

A short list of some of the glass found during the 1950s excavations was published in the main site report (Harden 1968a). A more thorough analysis of the excavated glass and the fragments retrieved by local resident Henry Durden when the site was ploughed in the 19th century, was published by Price in an article setting the assemblage against other contemporary groups from south west England (Price 2005b). The glass from both groups can be safely dated to within the c.10-year period of the occupation of the fort.

Cadbury Castle, Somerset

Site/area: Contexts from across the fort
Size of assemblage: 11
Publication: Price and Cottam 2000a
Original material examined at the Romano-British Glass Project, Durham University

This prehistoric hillfort near the village of South Cadbury in Somerset produced a small group of Roman glass from early in the post-conquest period, as well as some later Roman and post-Roman fragments. The chronology of the Roman period presence at the site is complex, but it appears that there was Roman military occupation with the construction of barracks within the hillfort, though the exact character of the deployment is not clear (Barrett, Freeman and Woodward, 175-8). The dating of this occupation is also open to discussion and cannot be directly connected with any particular campaign. However, the collection of early coins recovered from the site is thought to point to early post-conquest

activity, with no evidence yet of Neronian occupation (Casey 2000). The group therefore compliments the glass from the other early military sites in south-western England.

Waddon Hill, Dorset

Site/area: Contexts from across the fort
Size of assemblage: 37
Publication: Harden 1960 and 1979
Original material examined at Bridport Museum

Waddon Hill has been identified as a mid-1st century Roman fort situated on a flat-topped hill about six miles inland from the sea near Stoke Abbott in west Dorset. Although some Iron Age pottery and coins were found at the site, it is not regarded as having had significant prehistoric occupation. Excavations were led by Graham Webster from 1959 until 1969 and a series of reports were published as articles in the Proceedings of the Natural History and Archaeological Society of Dorset (Webster 1960 and 1979). Excavations revealed a system of bank and ditch defences and the remains of a number of timber buildings, tentatively identified as a *principia* and either a hospital or barracks as well as other structures described with more confidence as barracks. No coins later than Claudius were recovered and the site has been described as a fort housing both legionaries and auxiliaries in the decade c.A.D.50-60. The fort is seen as slightly post-dating Hod Hill, and has been discussed in the context of securing the south west of England in the campaigns against tribes in southern Wales. Abandonment of the fort has been associated with the Boudican revolt of A.D. 60/1 (Webster 1979, 53-6). There is little phasing information for the site as a whole, and none relating to the glass finds, which are here treated as belonging to a single occupation phase equivalent to the suggested date of the fort.

3.7.2 Other Sites in England and Wales

Brandon Camp, Herefordshire

Site/area: Contexts from across the fort
Size of assemblage: 9
Publication: Price 1987a

Excavations at this Roman military camp, which lies within a prehistoric hillfort, were conducted between 1981 and 1985 (Frere 1987). The layout of the buildings is not typical

of a Roman fort, being much more irregular, and the excavator suggested that it might have served as a 'temporary campaign base', probably between c.A.D.55-60 (Frere 1987, 63, 69-71). The dating derives principally from the ceramics.

Longthorpe, Cambridgeshire

Site/area: Contexts from across the fortress and work depot
Size of assemblage: 44
Publication: Charlesworth 1974
Original material examined at Peterborough Museum

This military site, just over 2 miles south west of Peterborough, has been identified as a vexillation fortress and associated work depot (Frere and St Joseph 1974; Dannell and Wild 1987). The fortress is thought to have been established in the late A.D.40s, perhaps A.D.48, according to the original excavators (Frere and St Joseph 1974, 5). No stratified Neronian coins were noted, and the end date for occupation is placed at around A.D.61-2. If this chronology is followed, then the glass vessels from the site provide a useful, relatively closely dated assemblage accumulated in just over ten years, though the fact that there is nearby later agricultural activity should be borne in mind.

Usk, Monmouthshire

Site/area: Contexts from across the fortress
Size of assemblage: 343
Publication: Price 1995

A legionary fortress was established at Usk on the river of the same name in the late Claudian or early Neronian period, with a likely foundation date around the mid-A.D.50s (Manning 1981, 24-39). Occupation, with the XX legion proposed as the garrison, lasted about twenty years until demolition in c.A.D.74, coinciding with the construction of the fortress at Caerleon downstream. Whether the fortress remained fully occupied throughout this period is debated, and a reduced garrison may have been in place from the late A.D.60s (Manning 1981, 45-52). The fortress was constructed of timber with turf and clay ramparts and extended across about 20 hectares. Major excavations from 1965 until 1976 uncovered numerous structures, including granaries, workshops, storerooms and part of a possible officer's house in Area 5 (Manning 1989, 100-113). The existence of a small later 1st century fort in the same area needs to be considered when the dating

of the glass is evaluated, but many of the pieces come from pit groups clearly associated with pre- and early Flavian activity.

Ribchester, Lancashire

Site/area: Contexts from across the fort
Size of assemblage: 14
Publication: Price and Cottam 2000b
Original material examined at the Romano-British Glass Project, Durham University

Extensive excavations at Ribchester, next to the river Ribble, in 1980 and 1989-90 revealed well-preserved evidence from a large timber-built fort of the 1st century A.D., followed by a stone fort constructed in the early 2nd century (Buxton and Howard-Davis 2000). A combination of dendrochronological, ceramic and coin evidence puts the foundation of the fort at around A.D.72-5 and it has been linked with the campaigns of Petillius Cerialis in A.D.72/3 (Buxton and Howard-Davis 2000, 43). The nature of the garrison in this early phase is not known.

Carlisle, Cumbria

Site/area: Construction of fort
Size of assemblage: 224
Publication: Cool and Price 1991, Cool 1992, Howard-Davies, 2009

Carlisle provides one of the key points in the time framework of this study, because of the close dating for the first Roman occupation of the site. Timbers from the construction of the earliest fort have been dated to A.D.72/3 (Zant 2009, 106-7). Glass assemblages from the construction and earliest occupation levels therefore supply closely dated material from the A.D. 70s. There is no evidence of Roman occupation at the site prior to the fort. Several sites have been excavated in the city centre and most relevant for this study are those that have produced dated sequences relating to the construction of the early fort at Annetwell Street and its surroundings. These include the excavations at Castle Street, Annetwell Street, and the "Millennium" excavations.

Wroxeter, Shropshire

Site/area: Drain deposit
Size of assemblage: 169
Publication: Price and Worrell 2006
Original material examined at the Romano-British Glass Project, Durham University

Wroxeter was founded as a base for the XXth legion in late A.D.50s, but developed as a town from the later 1st century onwards (Webster 2002, 17). There have been numerous excavation campaigns since the 19th century and several large assemblages of glass have been published. A group excavated from a drain alongside Watling Street, dating to the very end of the 1st/early 2nd century A.D, is of particular interest as it appears to have been a single deposit, with the vessels either discarded complete or very soon after breakage.

Red House, Corbridge

Site/area: Fort and bath house
Size of assemblage: 47
Publication: Charlesworth 1959a and 1979a

Evidence for a Flavian military base to the west of the later fort and town of Corbridge was found during excavations in 1974. An associated bath house had previously been excavated in 1955-7. The fort has long been considered a depot built to support the Roman advance into Scotland (Hanson, Daniels, Dore and Gillam 1979) with a date of c.A.D.80-8. It was short lived and was not subsequently occupied after being demolished. The demolition date is based upon the adoption of the site's Agricolan role, but the building of a further military base in the later Flavian period does strongly imply that the buildings had gone out of use by that point.

3.7.3 Military Sites in Scotland

Whilst the 1st century campaigns in southern and eastern Scotland left a significant archaeological imprint on the landscape, Roman troops were not present for more than about 10-15 years. First century military activity in Scotland had long been associated with Gnaeus Julius Agricola, governor of Britannia from c.A.D.77/8-84. According to the narrative of Tacitus (*Agricola*, 40), the northern campaigns ended soon after the termination of Agricola's governorship (Breeze 2006, 13-14, 29, 33-61; Maxwell 1989, 26-112). A slightly adjusted timeframe has been adopted by a number of scholars since the establishment of a firm date of A.D.72/3 for the building of the fort at Carlisle. Along with the significant occurrence of pre-Flavian material at a number of Scottish sites, for

example Camelon and Newstead, and a re-assessment of the dating of sites on the Gask Ridge, this new date for the foundation of Carlisle has prompted the suggestion that some military intervention in Scotland took place before the arrival of Agricola (Caruana 1997, 46-7; Woolliscroft and Hoffmann, 2006). Hanson however argues that the Scottish garrisons are unlikely to have been furnished with the latest in ceramics or glass and the presence of earlier material amongst the general equipment should not be a surprise (Hanson 2007, 647). A range of dates has therefore been put forward for the earliest campaigns, spread across the A.D.70s.

The end date for the 1st century occupation of Scotland is also subject to debate. Evidence from coinage issues seems to point to a date of around A.D.86 for the abandonment of a number of the Scottish sites north of the Forth (Hobley 1989; Hanson 2009, 52). Whatever the precise date, it is apparent that the military intervention in southern Scotland and the southern Highlands lasted for around 10-15 years and that it ended fairly abruptly in the mid-80s (Woolliscroft and Hoffmann 2006, 185-6). Sites that can be identified as falling within this period therefore have the potential to provide usefully dated groups of glass.

Elginhaugh

Site/area: Excavations across the fort
Size of assemblage: 41
Publication: Price and Worrell 2007
Original material examined at the Romano-British Glass Project, Durham University

The fort of Elginhaugh in Lothian was discovered by aerial photography in 1979. Evidence from excavations in 1979 and 1986-7 points to a Flavian occupation of the fort and annexe, though a single Trajanic coin was found in a ditch fill during more recent investigations. Other military installations on the other side of the river appear to date to the second and third centuries, so stray finds of a later date might not be unexpected (Maxfield 1974; Hanson 2007, 2). The buildings of the central range and the workshop appear to have only a single construction phase, though repairs were made. Some of the barracks appear to have had more than one phase of use. A foundation date post A.D.77/8 is suggested by the contents of a coin hoard found in the wall trench of the *principia* and the latest coins are unworn or only slightly worn issues of A.D.86.

Camelon

Site/area: Excavations within the fort and external settlement
Size of assemblage: 34
Original material examined at the Romano-British Glass Project, Durham University

Camelon was occupied both in the Flavian period and later, in the 2nd century A.D. and two fort areas have been recognised, a 'north' camp and a 'south' camp. Excavations in and around the south fort were undertaken in the 1970s and evidence of Flavian occupation was recovered. Whilst the 1st century occupation at Camelon has traditionally been associated with the Agricolan campaigns of c.A.D.77/8-84, it has been suggested by the excavator that the presence of certain classes of ceramics, including the *terra nigra* and the pre-Flavian fine-wares, points to a slightly earlier date, perhaps to the mid-70s (Maxfield 1984). A report on the glass from the excavations of the 1970s has been prepared for publication (Price and Cottam forthcoming).

Strageath

Site/area: Excavations across the fort
Size of assemblage: 6
Publication: Price 1989

The fort at Strageath was excavated between 1973 and 1986 and revealed both Flavian and Antonine occupation (Frere and Wilkes 1989). Activity in the 1st century A.D. appears to have terminated soon after A.D.86, the year of the latest coins, found in mint condition. The excavators believed the fort to be an Agricolan foundation (Frere and Wilkes 1989, 13), with a single period of occupation in the 1st century. Although over 400 fragments of glass were excavated, much was residual and only a small group could be dated with absolutely certainty to Flavian contexts. Although small, the group compliments glass from other contemporary Scottish sites.

Inchtuthil

Site/area: Excavations across the fortress
Size of assemblage: 26 (1952-65), 18 (1901/2)
Publication: Price 1985a, Hoffmann (n.d.)

The legionary fortress at Inchtuthil, on the banks of the river Tay, appears to have been occupied very briefly during the later 1st century campaigns in Scotland and some of the principal buildings do not even appear to have been constructed (Pitts and St Joseph 1985,

31). It therefore has the potential to provide a very tightly dated assemblage of glass. Major excavations took place from 1952-1965 (Pitts and St Joseph 1985). Drawing upon evidence from the coin assemblage, as well as literary references, the excavators suggested a probable abandonment date of A.D.86 or early A.D.87 (Pitts and St Joseph 1985, 280). A further small group of fragments from excavations in the early 20th century have also been included (Hoffmann n.d.).

3.7.4 Sites with Boudican Destruction

London

Site/area: One Poultry
Size of assemblage: 32
Hill and Rowsome 2011; Glass report: Wardle 2011

Site/area:15-23 Southwark Street
Size of assemblage: 46
Cowan 1992; Glass report: Shepherd 1992

Site/area: Plantation Place
Size of assemblage: 724
Dunwoodie, Harward and Pitt 2015; Glass report: Wardle 2015

Site/area: GPO (Newgate Street)
Size of assemblage: 136
Glass unpublished

Site/area: Borough High Street, (Jubilee Line Extension Project)
Size of assemblage: 30
Drummond-Murray and Thompson with Cowan 2003; Glass report: Wardle and Shepherd 2003

Site/area: 5-12 Fenchurch Street
Size of assemblage: 49
Hammer 1985
Glass unpublished.

Site/area: Paternoster Square
Size of assemblage: 100
Watson and Heard 2006; Glass report: Keily 2006

Site/area: Leadenhall Court
Size of assemblage: 320

Milne and Wardle, 1993; Glass report: Shepherd 1993

Site/area: St Swithin's House
Size of assemblage: 8
Wilmott 1991; Glass report: Price 1991b

Original material examined at all sites at the Museum of London and the London Archaeological Archive and Research Centre

The mid-later 1st century A.D. sites from Roman London provide an extensive body of data that can be used to explore and test the research proposals. Despite the inevitably patchy nature of urban excavation, which to a large extent relies on the redevelopment of small parcels of land, several sites have produced large assemblages of Roman glass fragments. This study draws on both the existing published material and on the unpublished glass seen at first hand in the London Archaeological Archive and Research Centre (LAARC). Nine individual sites from within Roman London have been included. Many different activities have been identified, including a fort, residential and commercial districts and industrial and semi-rural zones.

The dating of wooden drains at No.1 Poultry to A.D.47 has provided the earliest evidence for settlement on the site of Roman London (Hill and Rowsome 2011, 24). A number of sites have produced layers of debris equated with the Boudican destruction of London of A.D.60/1, a horizon that forms an important dated marker for this study. Whilst a direct link between these burnt layers and the Boudican revolt cannot be proved, the intensity, widespread nature and stratigraphical position of the destruction points strongly to a connection and has been widely accepted as highly probable in recent studies (Wallace 2015, 26-29). There are no other absolute dated contexts for 1st century Roman London. However, post-excavation analysis of individual sites has yielded instances where relatively precise dating of site formation processes can be identified. This is the case in particular at Leadenhall Court (Milne and Wardle, 1993) and the fort at Plantation Place (Dunwoodie, Harward and Pitt 2015) where glass assemblages associated with discrete phases in the later 1st century can be isolated.

Colchester

Site/area: Sites within the fortress and colonia and the Sheepen industrial area
Size of assemblage: 536

Publication: Harden 1947, Charlesworth 1985, Cool and Price 1995

Nearly one hundred years of excavation and research in Colchester and the surrounding area have provided large quantities glass fragments, and many can be closely dated to the earliest years of Roman occupation. Excavations have been carried out within the legionary fortress and the later *colonia* and at Sheepen Hill, a site recognised as an industrial area about half a mile to the north west of the fortress and later town (Niblett 1985, 23-4). The *colonia* is recorded by Tacitus as being burnt to the ground during the Boudican revolt of A.D. 60/1 (*Tac. Ann*, 14, 32) and widespread areas of burning and destruction of around this date have been generally accepted as being a clear dated horizon in the stratigraphy of the site (Hawkes and Hull 1947, 38-43; Crummy 1984, 9-10). Two assemblages come from the Sheepen industrial area, one from excavations in the 1930s, and a second group from excavations in the 1970s. The latter group is likely to have been subject to better recovery, and this, along with the glass from the fortress and *colonia*, has been fully examined and quantified (see table 3.2). The Roman settlement at Colchester stands apart from other post-conquest sites in Britain, having already had an enhanced status as a major late Iron Age political hub, before becoming a legionary base and *colonia* as well as a centre for the imperial cult.

Verulamium

Site/area: Areas across the town, including Insula XIV

Size of assemblage: 13

Publication: Charlesworth 1972, 1984, Allen 1983

Although there is considerable evidence of the pre-Roman settlement of the area on which the Roman town on Verulamium was founded, no firmly dated pre-conquest vessel glass is recorded. Roman occupation appears to have begun shortly after the conquest and signs of a large-scale fire, noted in several parts of the Roman town, suggest that a single burning incident took place in the early Neronian period (Niblett and Thompson 2005, 146-150). This fire has been regarded by many commentators as being linked with the destruction of the town during the Boudican revolt of A.D.60-61, as recorded by Tacitus (*Tac. Ann.*, 14, 33). If this is the case, then glass from deposits just beneath and within the burnt layers can contribute firmly dated material for this study. Glass from pit 7 in Insula XIV, may have been deposited soon after the early Neronian fire (Frere 1972, 23).

3.8 Summary of Dated Assemblages

The sites listed above provide dated groups of glass from many different types of site. These include urban sites with domestic and commercial activity as well as military establishments and their associated settlements. Glass from rural settlements is absent because it has proved difficult to identify very clearly dated groups. Sudden catastrophic events of the sort that provide closely dated sequences are much less likely to be chronicled at rural settlements that at urban sites. Dated changes in occupation such as occur at military sites are also difficult to pin-point chronologically in rural situations. Less intense occupation means stratigraphic sequences are not so well-defined, and a reduced number of dated finds at rural sites, such as coins or fine ceramics, makes subtle dating more problematic.

The glass assemblages selected for analysis are therefore from urban and military sites, with glass from each decade from the A.D.40s to about A.D.100/110 included in the survey. The assemblages have been grouped across seven dated bands, A-G (Table 3.1), to allow data to be compared chronologically. Some assemblages fall within a single band (for example Pompeii), whilst other sites, where deposition is extended over a greater period of time (for example sites in London), have been subdivided according to phase.

As Table 3.1 illustrates, there is a fairly even spread of individual sites representing about sixty years of glass vessel development. The circumstances of deposition are inevitably different at each site. Several of the sites experienced sudden, and in some cases catastrophic destruction. These include Pompeii, Cremona, Colchester, Verulamium and London. In the first case however, there was no further significant occupation in the immediate aftermath of the Vesuvian disaster. The glass assemblage was effectively sealed in situ, undisturbed by further occupation. Furthermore, the preserved vessels are complete, with the result that they can be recognised and assessed independently of fragments of broken and discarded vessels from earlier contexts. The glass from Cremona and from the pre-Boudican sites at Colchester, Verulamium and London presents a slightly different challenge as at these sites there has been intense subsequent occupation and potential disturbance. At sites where there was some fore-warning of the disaster

about to happen, there is the added complication that some of the glass (perhaps the most valuable) may have been removed by people leaving the area beforehand with possessions. Written sources as well as in some cases the archaeological evidence suggests that for Pompeii and the sites destroyed in the Boudican revolt, this may have been the case (*Plin. Ep.* 6.16 ; *Tac. Ann.* 14, 33).

Given the number of sites in the review, some overlap between sites within the dated bands, and also between bands is inevitable. In some instances, different sites have temporal divisions which exactly match, an obvious case being those sites affected by the Boudican uprising of A.D.60/1 in London, Colchester and Verulamium. In bands A and B and D-G, the chronological bands bring together sites where the phasing corresponds closely enough to be able to form meaningful groups, even when the start and end points of the phases may not exactly concur. Band C has been designed to include glass from a wider period (c.A.D.40-60), which could not be more closely dated within bands A or B. Whilst exact synchronisation across sites and phases does not always occur, this system enables the large number of different assemblages and sub-assemblages to be managed.

A.D.40s-mid-50s	A.D.50s-c.60	A.D.40s-60	A.D.60s-c.70	A.D.70s-c.85	Mid/late A.D.70s-mid-A.D.80s	Late A.D.80s-A.D.100/110
A	**B**	**C**	**D**	**E**	**F**	**G**
Colchester	Colchester	Colchester	Moers-Asberg	Pompeii	Camelon	London Plantation Pl (4)
Hod Hill	London, One Poultry (202)	London, Paternoster Sq (2-3)	Cremona	London Leaden-hall Ct (2)	Corbridge	London Leaden-hall Ct (5)
Velsen II	London Plantation Pl (2)	Cadbury Castle	Eysses	London, Paternoster Sq (4)	Elginhaugh	Wroxeter drain
London, One Poultry (201)	London, Newgate St	Lake Farm	Usk	London Plantation Pl (303-304)	Inchtuthil	Nijmegen *canabae legionis*

London, Southwark St (1)	London, Borough High St	Longthorpe	London Plantation Pl (301-302)	Carlisle	Strageath	Barzan
Lyon	London, 5-12 Fenchurch St		London, Southwark St (2)	Ribchester	London, Newgate St	
	Verulamium		Nijmegen Kops		London Leaden-hall Ct (3)	
	Brandon Camp		Usk		London, St Swithin's House	
	Waddon Hill		Valken-burg			
			Xanten Vetera I			
Total number of fragments in each band						
772	479	455	2293	1458	497	2839

Table 3.1 Sites selected for analysis grouped by dated band with fragment totals

3.9 Issues Concerning Quantification

3.9.1 Resolving differences in methods of quantification

One of the most challenging aspects in assessing the chosen assemblages was the issue of quantification. Quantifying glass consistently raises difficulties and no standard method has been adopted by glass specialists either in Britain or elsewhere. A simple count of fragments is generally unsatisfactory when pieces can clearly be seen to come from the same vessel. In smaller assemblages where it is easier to take an overview of the whole group it is usually more straightforward to identify fragments from the same vessel, but for larger assemblages where there can be many hundreds of undecorated blue/green fragments, identifying pieces of the same vessel is problematic. Calculations of minimum numbers are often recorded in glass reports, but there is no systematic, universally accepted way of arriving at these figures. Estimations based on fabric, as used in pottery studies, are evidently of little use in the study of glass. Other techniques from pottery studies, such as EVEs (estimated vessel equivalents), where the presence of particular

features such as bases and rims is used to arrive at a standardised figure, are all difficult to transfer to glass, as glass vessels have a different and wider range of distinguishing elements. Cool and Baxter provide a useful discussion of glass quantification, taking these points into question and proposing a system based on the identification of different parts of the profile of glass forms (Cool and Baxter 1996). The subject has also been addressed by Prior in his study of several large 1st century A.D. assemblages, where preference was given to using a calculation for the minimum number of individuals (MNI) (Prior 2015, 77-95). However, in the absence of a generally adopted method of quantification, many specialists use what can be described as best judgement, where fragments that are likely to come from the same vessel, given their visual similarity and close contextual position, are catalogued together and undiagnostic fragments are listed or presented as general totals. There is no doubt that this system over-emphasises the occurrence of plain blue/green vessels, since strongly coloured and decorated fragments are less numerous and can be more confidently attributed to the same vessel. However, if undiagnostic, blue/green fragments were presented as a single minimum vessel, then the opposite would be true, and they would be severely under-represented in the final totals. It is clear therefore that quantification is never going to be an exact science and that certain caveats, such as those noted here, will always have to be borne in mind.

As was noted in Section 3.3, many assemblages were assessed at first hand whilst in other cases reference was made to publications. Inevitably then, for published material, there will be different methods of quantification adopted by the specialists involved. Sometimes the method used is made explicit in the report (as for example at Colchester, Usk, Lyon and Elginhaugh) whilst in other cases the method can be inferred from the structure of the catalogue. Since a consistent system of quantification is not possible across all assemblages within the constraints of this study, a judgement has been made in each case as to the reliability of the data, and this is noted in the relevant sections of Chapter 4.

3.9.2 Sample size and composition

The assemblages range significantly in size, from single figures to thousands of fragments. Combining the assemblages together in chronological bands (Table 3.1) helps to combat these irregularities so that the limitations of sample size will not inhibit the

identification of patterns of glass production and use. The quantities in each band are given at the end of Table 3.1. In some cases, where published glass reports have been used, undiagnostic fragments were not listed exhaustively. Whilst this does not have a significant negative effect on data relating to recognised vessel forms, as these are noted in the reports, there is a possibility that fragments which are undiagnostic in terms of form, but diagnostic in colour, are not listed. This could potentially impact on the recording of data concerning colour, possibly even omitting altogether the presence of rarer colours in some assemblages. For this reason, certain assemblages and combinations of assemblages, where there is more certainty that all fragments were recorded, have been categorised as full samples (Table 3.2). The data from these have been used in particular in the Chapter 6 discussion of colour.

Assemblage name	Date	Size
Colchester 1 (1970s and 80s excavations), Band A	c.A.D.43-c.55	54
Lyon (Rue Bourgelat), Band A	c.A.D.50-54	622
Colchester 2 (1970s and 80s excavations), Band B	c.A.D.55-61/5	182
London (pre-Boudican), Bands A-C	c.A.D.47-61	196
Lake Farm, Band C	A.D.40s-A.D.60s	155
Cremona (Piazza Marconi), Band D	A.D.69	536
Usk, Band D	c.A.D.55-late	343
Eysses, Band D	A.D.60s	499
	c.A.D.65-72	
Pompeii (*Regio* I), Band E	A.D.79	947
London Plantation Place 3 (303-304), Band E	A.D.70s-early	125
	A.D.80s	
Elginhaugh, Band F	c.A.D.79-85	41
Inchtuthil, Band F	c.A.D.84-5	44
London Leadenhall Court 3 (Period 3), Band F	c.A.D.75-85	187

London GPO (Newgate St Period 6), Band F	c.A.D.75/85-90	130
Nijmegen (*Canabae Legionis*), Band G	c.A.D.100	2,200
London Leadenhall Court 5 (Period 5), Band G	c.A.D.95-100	68
London Plantation Place 4 (Period 4), Band G	c.A.D.85-120	422
Barzan, Band G	c.A.D.110	370

Table 3.2 List of fully quantified sites with associated dated band

3.10 Examining the Assemblages

This survey has involved a considerable amount of detailed examination of glass fragments from Britain, France, Italy, the Netherlands and Germany. Every effort has been made to study the glass from the chosen sites at first hand, as the identification of many forms involves close direct observation of the glass quality, its surface finishing, profile, decoration and other subtle characteristics. Viewing the colour of glass fragments in person also helps to bring consistency to the recording process. In some cases, it was not possible to view the chosen glass assemblages either because the museums housing the collections were under refurbishment or because of the time constraints involved. In these cases, published reports were used to assess the fragments. Using material identified and discussed by a third party will inevitably raise questions of accuracy. For this reason, two criteria were adopted when using published material; either the report should contain a comprehensive descriptive catalogue and illustrations, so that identification could be amended if necessary, or the report should be the work of a specialist whose familiarity with the material meant that they could be relied upon to identify glass vessels to an acceptable standard. In many instances where published material was used (for example the assemblage at Usk), both criteria were applicable.

In the next chapter, data from each of the chosen assemblages will be presented in a series of dated ‘bands’ as outlined above (Table 3.1). Each of the assemblages will be summarised to produce the main body of data for the analysis presented in chapters 5-8.

Chapter Four
Analysis of the Data

4.1 Introduction

In this chapter information from each of the selected sites is presented in the chronological sequence outlined in Chapter 3.8. There are seven chapter sections, based upon the dated bands A-G (Table 3.1) covering periods of time from c.A.D.40-c.A.D.100/110. Within each section, the data from individual sites are presented in summary tables. These record the number of vessels identified according to technique of manufacture, colour, form and decoration. Specific recognised forms are listed and there is a brief description of the glass recovered. This approach has been taken with the aim of translating the high volume of data generated during data collection into a manageable format which is consistent across each assemblage. At the end of each section, the information from the sites is brought together to provide an overview of the characteristics of each band. The data are analysed and discussed in further depth in chapters 5-7 which cover aspects of form, colour and manufacture.

There is considerable variation in the number of fragments from each site. For some of the smallest assemblages, such as Ribchester, it is possible to grasp at a glance the vessels represented and the nature of the assemblage. Other larger and more complex groups are more difficult to absorb. Consequently, a consistent strategy of recording and presentation was devised to allow the groups to be compared. Each piece was examined and its attributes entered in spreadsheets specifically designed to fit the purposes of this investigation (Fig.4.1). The spreadsheets logged context and phasing information, technique of manufacture, form (if identifiable) and part of vessel, colour, quantity and any comments of particular interest. The information derived from each spreadsheet was examined and processed, before being summarised in table form.

	A	B	C	D	E	F	G	H	I	J	K	L
1	SITECODE	PERIOD	CONTEXT	ACC NO	QUANTITY	TECHNIQUE	COLOUR	FORM	PART	TYPOLOGY	COMMENTS	ILLUSTRATED
2	FER97	2	3058	1870	1	NONBLOWN	BGR	BOWL	RIM	ISINGS 3		
3	FER97	2	3236	2324	1	BLOWN	DBL	FL/UBOT	BODY			
4	FER97	2	3236	2325	1	BLOWN	BGR	JUG	HANDLE			
5	FER97	2	3237	2326	1	BLOWN	BGR	PLATE/BC	RIM			SKETCHED
6	FER97	2	3425	2673	1	BLOWN	BGR	?FL	BODY			
7	FER97	2	3544	2674	1	BLOWN	YGR	VESS	BODY			
8	FER97	2	3544	2675	1	BLOWN	YBR	VESS	BODY			
9	FER97	2	3922	2971	1	BLOWN	POLY	?MOD	BODY		DBL & OP WHITE POSSIBLY SAME VESSEL AS 2979	Y

Fig.4.1: Section from the spreadsheet for Plantation Place, London

The recording of specific decorative techniques has been confined to blown vessels as there are too few non-blown vessels, other than ribbed bowls, to provide a meaningful sample to examine changes in these vessels. A precise description of polychrome techniques has also been restricted to blown vessels for similar reasons.

Bottles are in all cases considered separately from tablewares for the following reasons. They are almost always produced in blue/green glass and therefore contribute little to the discussion of colour change during the period in question. They are very rarely decorated at this period, though occasional cylindrical examples with horizontal wheel-cutting are known, for example at Fishbourne, West Sussex (Price and Cottam 1996, 184, 143-4 Fig.6.31). The rims, necks and handles of all bottle shapes are very similar and it is not possible to tell from these fragments the exact form of the bottle in question. However, where the relative quantity, the form or the decoration of the bottles in any individual assemblage is of interest, this is noted. Fragments of particular significance have been illustrated, either with photographs, original drawings or where this has proved impractical, with drawings from reliable reporters known to work to a high standard.

4.2 Band A: Early A.D.40s – c.A.D.55

4.2.1 Introduction

The earliest dated group comes from six sites with occupation dating between the early A.D.40s and the mid-A.D.50s, three from Roman Britain (including two in London), one from the Netherlands and one from France. There is considerable variation in the nature of occupation within this small group, with the Rue Bourgelat group from Lyon probably representing the most prestigious end of the scale in terms of civilian status, whilst Hod Hill as a campaigning fort represents the purely military. This mixture is an advantage for the study as differences in function and status will almost certainly have influenced the type of glass being consumed at each site. A group of varied origins is therefore more

likely to be representative of types of glass in use across the period. Within the band it has been possible to subdivide the sites into two narrower date ranges (A1 and A2), to examine if there is any perceptible shift in the character of the glass within the fifteen years of the wider band.

4.2.2 Band A1 (Early A.D.40s – early/mid-A.D.50s)
Colchester; Hod Hill; Velsen II

Colchester (Fig.4.2.1)

Three groups of the earliest glass from Colchester have been brought together to form a single assemblage dating from the immediate post-invasion period until the late A.D.40s-early 50s. Two come from excavations in the Sheepen industrial area (Harden 1947; Charlesworth 1985). The presence of stratified glass, albeit in small quantities, is intriguing, as there is no suggestion of glassworking or even of substantial structures at this point. It is very possible that the glass has come from elsewhere, perhaps as rubbish from the settlement at Colchester. The third group comes from excavations within Colchester itself from 1971-1985, just under a kilometre to the east. This is a larger collection and represents glass found over a slightly longer period, extending into the early A.D.50s, covering the transition, usually dated to A.D.49, from legionary fortress to c*olonia*. The figures for the two Sheepen sites do not include undiagnostic fragments.

Assemblage/period	Date	Recorded items
Harden 1947 Periods II & III	c.A.D.43-49	9
Charlesworth 1985 Period III	c.A.D.44-49	9
Cool and Price 1995 Claudian	c.43-c.50/55	32
Total		50
Production method (excluding bottles)		
Non-blown	19	
Blown	25	
Colour (excluding bottles)		
Polychrome	8	
Opaque blue	1	
Dark blue	1	

Dark green	4
Yellow/brown	4
Yellow/green	1
Pale green	2
Blue/green	23
Decoration (blown vessels)	
Blobs	1
Ribs	1
Wheel-cut lines	6
Trails	3
General vessel forms	
Drinking vessel	6
Bowl	20
Jug	3
Jug/flask	4
Jar	1
Jar/jug	2
Unguent bottle	3
Bottle	6

Table 4.2.1 Summary of vessel attributes (minimum numbers) from Colchester, c.A.D.43-c.50/55

The assemblage has a wide range of colours, with 8 colour categories identified, including polychrome and one opaque monochrome vessel. The most numerous single vessel form is the non-blown ribbed bowl, mainly in blue/green, but also in strong colours and polychrome glass (Fig.4.2.1.a). Polychrome decoration is present in the form of blobs and trails. Two vessels are decorated with simple contrasting opaque white trails. One these can be identified as a distinctive form of small cup (Isings form 17) which has narrow vertical ribs as well as trails (Fig.4.2.1.b). Of particular interest is a vessel with unmarvered blobs, identified by Harden as coming from a jug or flask (Harden 1947, 297 no.32 pl.LXXXVII). This piece is unusual both in the number of colours used in the decoration (opaque white, purple, pale green, pale blue and yellow) and because they have not been marvered, but stand proud of the wall of the vessel.

Bowls considerably out-number all other general vessel forms, but this may well be because of the high visibility of the non-blown ribbed bowls (Isings form 3), which make up 16 out of the 20 bowls recorded. The other two non-blown vessels, both dark green, are more tentatively identified. One may come from a shallow bowl with a flat base and low base ring (Isings form 5), whilst the other is a deeper convex bowl with a trace of a handle, perhaps a two-handled scyphus, or perhaps a one-handled trulla. Closed vessels are very much less common than open forms. Only three specific forms were identified, a conical jug, two tubular unguent bottles and a square bottle (Fig.4.2.1.d).

Hod Hill (Fig.4.2.2)

Two assemblages are discussed together, glass from the Richmond excavations (Harden 1968) and items from the Durden collection (Price 2005b). The Durden collection has a high percentage of fragments from polychrome and strongly coloured vessels as well as the easily identified non-blown ribbed bowls (Isings form 3). This may reflect the process of retrieval from ploughsoil, where colourful and decorated fragments that stood out were collected whilst undiagnostic blue/green fragments were left behind.

Assemblage	Date	Recorded items
Durden collection	c.A.D.43-51	26
Richmond excavations	c.A.D.43-51	23
Total		49
Production method (excluding bottles)		
Non-blown	9	
Blown	6	
Colour (excluding bottles)		
Polychrome	7	
Dark blue	1	
Dark green	1	
Blue/green	4	
Greenish colourless	2	
Decoration (blown vessels)		

Wheel-cut lines	2
Splashes	1
Trails	2
Cased glass	1
General vessel forms	
Drinking vessel	3-4
Bowl	10-11
Jug	?1

Table 4.2.2 Summary of fragments from Hod Hill

Polychrome vessels (three non-blown and four blown) make up nearly half the total number. One fragment comes from a convex bowl in strip mosaic glass, a very rare example of this type of polychrome glass from Roman Britain. Nineteen fragments (part shown in Fig.4.2.2) come from a non-blown ribbed bowl with an out-turned rim, which may have had a foot, a form described by Price as 'unique' in Roman Britain (Price 2005b, 101 Fig.7). A fragment from a yellow/brown and opaque white cased vessel has been tentatively identified as a cantharus, and a second may be represented by a dark blue blown, separately-applied foot. There are three examples of wheel-cut cups (Isings form 12) and two of these are unusual polychrome examples with marvered zig-zag trails. A final polychrome blown fragment comes from and blue vessel, possibly a jug, with opaque white marvered splashes.

Velsen II (Fig.4.2.3)

Two sets of excavations produced glass, and the assemblages have been combined here. Perhaps owing to its short occupation, only 15 identified vessels were noted during excavations in the 1960s (van Lith 1977, 7). A further 11 vessels came from excavations in 1997 (Bosman and de Weerd 2004, 44).

Period	Date	Recorded items
Early Claudian	c.A.D.40-43/7	26
Production method (excluding bottles)		
Non-blown	9	

Blown	15
Colour (excluding bottles)	
Polychrome	1
Opaque white	1
Dark blue	1
Dark green	1
Yellow/brown	3
Dark yellow/green	1
Pale green	1
Blue/green	16
Decoration (blown vessels)	
Cut-out fold	1
Wheel-cut lines	5
General vessel forms	
Drinking vessel	5
Bowl	10
Jug/flask	1
Flask	5
Unguent bottle	3
Bottle	1-2

Table 4.2.3 Summary of vessel attributes (minimum numbers) from Velsen II

Eight colours, including polychrome, and six general forms were noted. The most numerous vessel form is the bowl and again the non-blown ribbed bowl (Isings form 3) dominates (Fig.4.2.3.a). The single fragment of polychrome glass came from a non-blown ribbed bowl, and a rare opaque white example was also noted. Decoration on the blown vessels was restricted to horizontal wheel-cutting on five convex cups (Isings form 12) and a horizontal fold just below the rim of a vessel that cannot be securely identified (Fig.4.2.3.c), but could be a large cup for example a one-handled vessel or modiolus (Isings form 37) or a cup with a stem base, or cantharus (Isings form 38). Flasks and unguent bottles were relatively numerous (Fig.4.2.3.b). Two blue/green fragments were described as possibly coming from hexagonal bottles, which, if correctly identified, would be very early examples of the type.

4.2.3 Band A2 (c.A.D 50-55) Site Analysis
Colchester; London One Poultry; London 15-23 Southwark Street; Lyon

Colchester (Fig.4.2.4)

This tightly dated phase of activity in the pre-Boudican *colonia* was only defined at one site, Balkerne Lane, and produced 13 securely dated fragments.

Period	Date	Recorded items
Late Claudian	c.A.D.49-50/5	13
Production method (excluding bottles)		
Non-blown	2	
Blown	10	
Colour (excluding bottles)		
Polychrome	3	
Dark green	1	
Yellow/brown	1	
Blue/green	7	
Decoration (blown vessels)		
Wheel-cut lines	2	
Blobs	1	
General vessel forms		
Drinking vessel	2	
Bowl	4	
Jug	2	
Jug/flask	1	
Bottle	1	

Table 4.2.4 Summary of vessel attributes (minimum numbers) from Colchester c.A.D.49-50/5

The two non-blown vessels are both ribbed bowls (Isings form 3), both of which are polychrome (Fig.4.2.4.a and b). A blown polychrome vessel was also found, although the form cannot be identified. Two blue/green wheel-cut cups of Isings form 12 (Fig.4.2.4.c) and two tubular rim bowls, both strongly coloured (Isings form 44 or 45) were also identified (Fig.4.2.4.d and e). The use of a post and a pontil on two unidentified base fragments was also noted.

London, One Poultry, Period 201 (Fig.4.2.5)

The earliest activity at One Poultry dates to the later 40s, when an east-west road (*Via Decumana*) was constructed. Some dumping and landscaping is associated with this phase (Period 2 phase 1) as well as some early timber structures. Timbers associated with the consolidation of wet ground to the south of the road have been dated to A.D.47, the earliest firmly dated activity for Roman London.

Period	Date	Recorded items
Period 201	A.D.47-55	8
Production method (excluding bottles)		
Non-blown	1	
Blown	6	
Colour (excluding bottles)		
Yellow/brown	1	
Pale green	1	
Blue/green	5	
Decoration (blown vessels)		
Wheel-cutting	1	
General vessel forms		
Bowl	1	
Jug/flask	3	
Bottle	1?	

Table 4.2.5 Summary of vessel attributes (minimum numbers) from London, One Poultry Period 201

Only eight vessels were recovered from this phase, most were blue/green and only one, a non-blown ribbed bowl (Isings form 3) can be definitely identified (Fig.4.2.5).

London, 15-23 Southwark St, Period 1

The earliest features at this site, just south of the river Thames, are a collection of gullies and ditches, with evidence for a possible circular building (Cowan 1992, 8-13). The finds do not point to occupation and the proposed building is interpreted as probably an out-house. Part of a copper sheath guard is tentatively connected with nearby military activity.

Period	Date	Recorded items
1	Early Roman	4
Production method (excluding bottles)		
Non-blown	0	
Mould-blown	1	
Blown	1	
Colour (excluding bottles)		
Polychrome	1	
Blue/green	1	
Decoration (blown vessels)		
Cased	1	
General vessel forms		
Bottle	2	

Table 4.2.6 Summary of vessel attributes (minimum numbers) from London, 15-23 Southwark Street Period 1

Only four fragments of glass can be related to the earliest phase, one of which is of note - a cased cup, with a dark blue outer surface and opaque white inner surface.

Lyon, Rue Bourgelat (Fig.4.2.6-9)

This site, within the peninsula delineated by the Rhône and Saône rivers, appears to have seen mixed use, part town house, part commercial, as well as industrial (Bertrand 2011,

44-48). The coinage and ceramics place the deposition of the assemblage to within the Claudian period and it contains a substantial number of fragments and many identifiable vessel forms (Robin 2011, 2012a, 2012b).

Period	Date	Recorded items
Claudian	c.A.D.50-54	622
Production method (excluding bottles)		
Non-blown	64	
Mould-blown	1	
Blown	554	
Colour (excluding bottles)		
Polychrome	17	
Opaque white	3	
Opaque blue	7	
Opaque green	2	
Opaque red	2	
Dark blue	62	
Mid blue	8	
Dark green	52	
Purple	5	
Yellow/brown	10	
Yellow/green	4	
Olive green	1	
Pale green	37	
Blue/green	417	
Colourless	3	
Decoration (blown vessels)		
Ribs	2	
Painted decoration	1	
Blobs	2	
Trails	5	
Wheel-cut lines	21	

Cut-out fold	2
General vessel forms	
Drinking vessel	39
Bowl	43
Jug	13
Jar	2
Unguent bottle	14

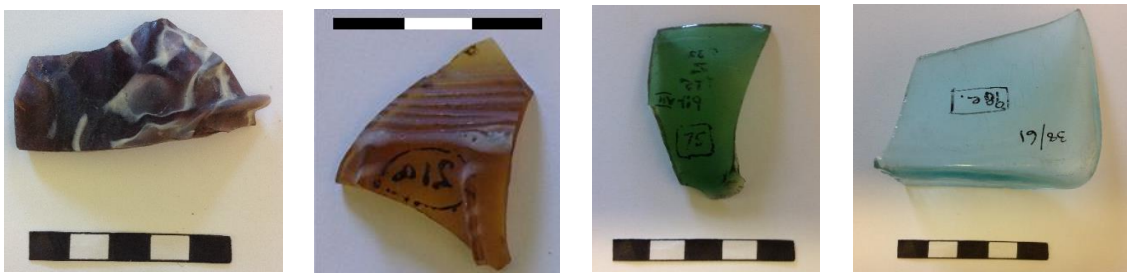
Table 4.2.7 Summary of vessel attributes (minimum numbers) from Lyon, Rue Bourgelat

The assemblage has a particularly diverse colour range. Polychrome vessels include two rare 'gold in glass' fragments and a cup with painted decoration (Fig.4.2.8.c). Amongst the monochrome strong colours, dark blue and dark green are particularly prominent and there are four shades of opaque glass. Cups and bowls far outnumber other forms. Non-blown ribbed bowls (Isings form 3) are the most frequently identified bowl form (Fig.4.2.6). Non-blown cups and bowls with profiles resembling contemporary ceramic forms (e.g. Isings forms 2 and 22) are well represented (Fig.4.2.7).

Blown drinking vessels feature strongly (Fig.4.2.8.a-e) with wheel-cut cups the most common single blown form. A few wheel-cut beakers were also recognised (Fig.4.2.8.d-e). Two cups or small bowls have pinched ribs (Fig.4.2.9.a-b), one of which is also decorated with opaque white trails (Isings form 17). There are several large open vessels, some with polychrome decoration, which may have been used for drinking or for display. Two with stepped rims have been tentatively identified as canthari (Fig.4.2.9.f-g) and there are one or possibly two, modioli (fig 4.2.9.e). Another vessel also has the trace of a handle and has been identified as a scyphus (Fig.4.2.9.c).

There are rim, neck and handle fragments from at least 13 jugs, though at least two of the rim fragments are large enough to be bottles. Bottles are otherwise scarce. The most numerous containers are small tubular unguent bottles of which there are 12 (Fig.4.2.8.g) and there is a single spherical unguent bottle decorated with a narrow spiral trail (Fig.4.2.8.f).

Fig. 4.2 Vessels from Band A



a b c d

Fig.4.2.1 Vessels from Colchester, Band A1

Fig.4.2.2 Ribbed bowl from Hod Hill © British Museum

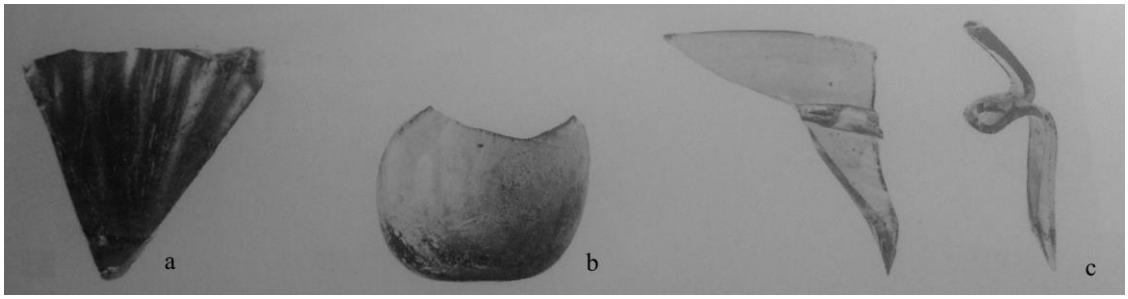


Fig.4.2.3 Vessels from Velsen (reproduced from van Lith 1977)

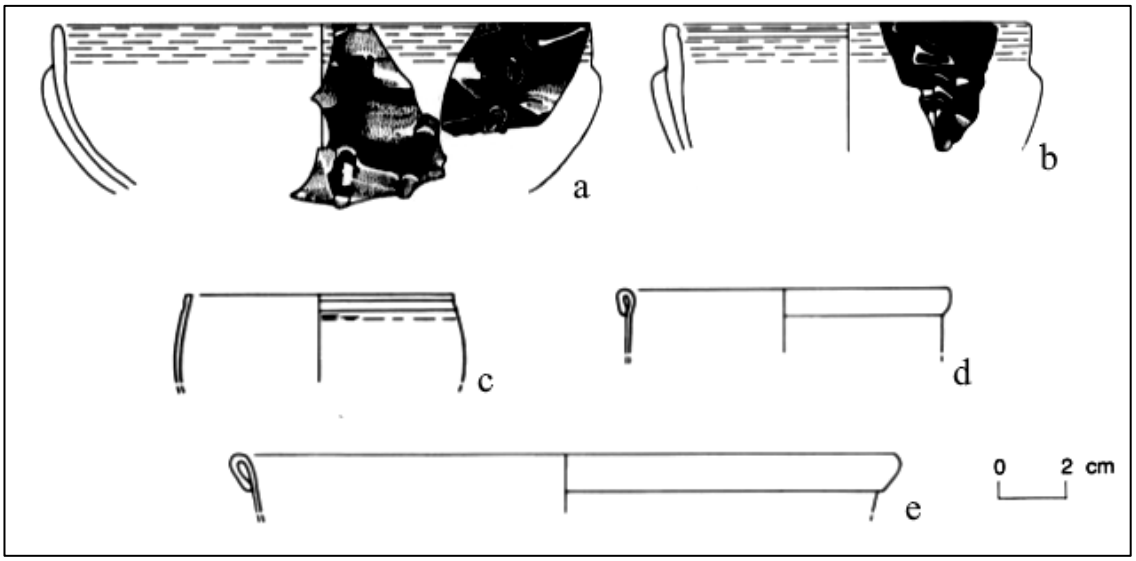


Fig.4.2.4 Vessels from Colchester, Band A2 (reproduced from Cool and Price 1995)

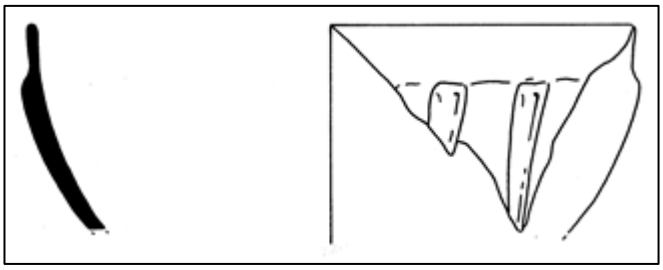


Fig.4.2.5 Non-blown blue/green ribbed bowl from London, One Poultry (Acc no.3616) 2:1

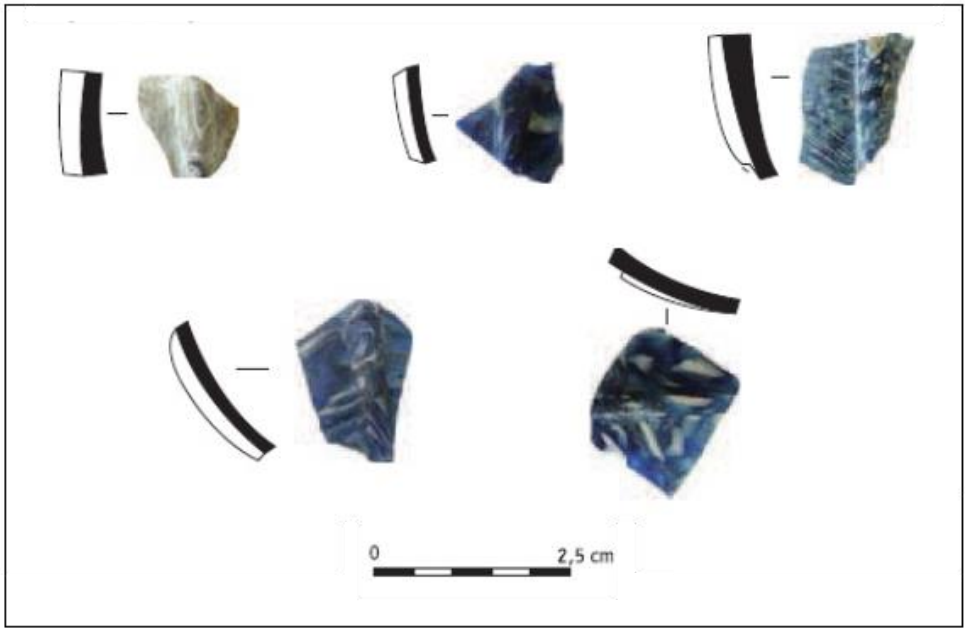


Fig.4.2.6 Polychrome non-blown ribbed bowls from Lyon Rue Bourgelat (reproduced from Robin 2011)

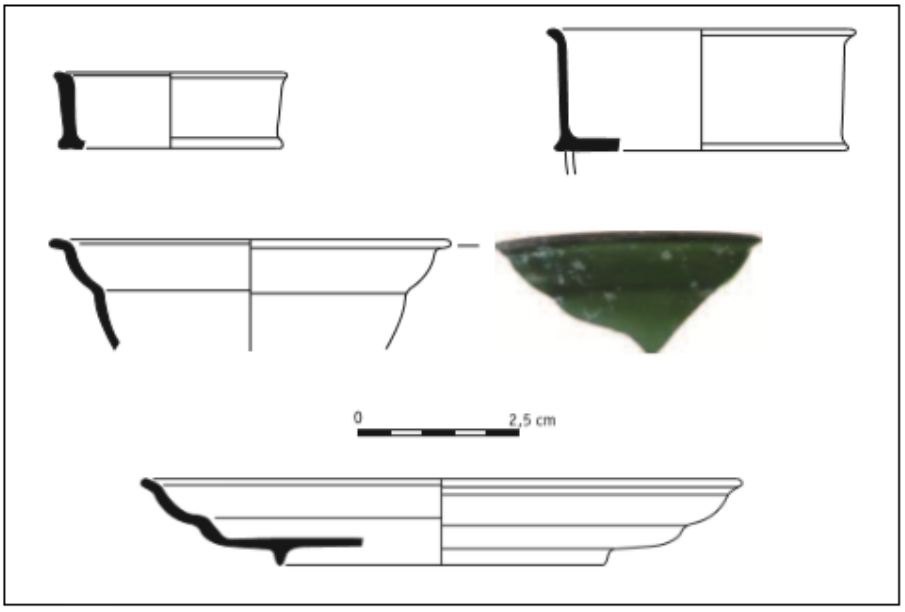


Fig.4.2.7 ‘Ceramic’ form vessels from Lyon Rue Bourgelat (reproduced from Robin 2011)

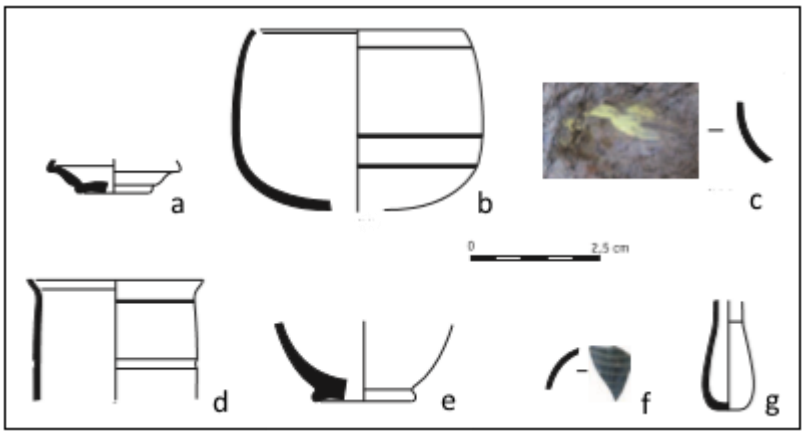


Fig.4.2.8 Blown vessels from Lyon Rue Bourgelat (reproduced from Robin 2011)

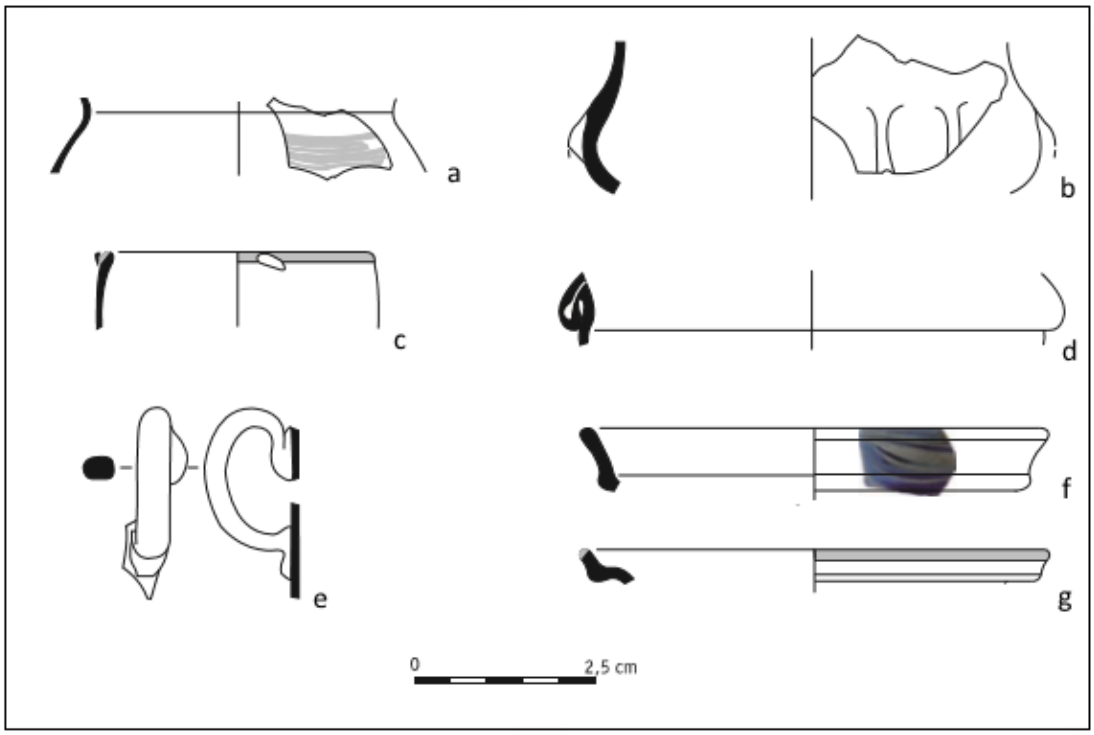


Fig.4.2.9 Blown vessels from Lyon Rue Bourgelat (reproduced from Robin 2011)

4.2.4 Review of the Glass from Band A

The vessels brought together in band A come from securely dated contexts at six sites, spanning fifteen years. The two London sites have been grouped together in the following tables, as they are so small. The band has been divided into two sub-groups, the first relating to the timespan c.A.D.40-50/55 and the second with a slightly more refined dating of c.A.D.50-55. There is a considerable difference in the size of the assemblages in this band, with Lyon being thirteen times the size of the next largest group in this section. Lyon also stands in contrast with the other groups in being a well-established urban centre and provincial capital, with all the qualities associated with that status. Three of the other sites, Colchester, Hod Hill and Velsen are military, and London is a new foundation, in the earliest phases of establishing itself as a port and trading settlement.

A. Manufacture

The majority of vessels are free-blown and though non-blown vessels form a significant proportion of nearly all the groups, they only outnumber blown forms at Hod Hill (Table 4.2.8). Only two mould-blown tablewares of uncertain form were noted, at Lyon and 15-23 Southwark Street London, and this technique has a negligible presence in band A.

	Non-blown vessels	Mould-blown vessels	Blown vessels
Colchester (56)	40%	0	60%
Hod Hill (49)	60%	0	40%
Velsen II (25)	39%	0	61%
London (9)	5%	5%	90%
Lyon (622)	10.6%	0.1%	89.3%

Table 4.2.8 Manufacturing methods in Band A as a proportion of tableware assemblage, using minimum vessel numbers (in brackets)

B. Colour and Decoration

The group as a whole is notable for its variety of colour, even if in some cases the colour is only represented in a single vessel. Fig 4.2.10 illustrates the simple presence of individual colours for each site.

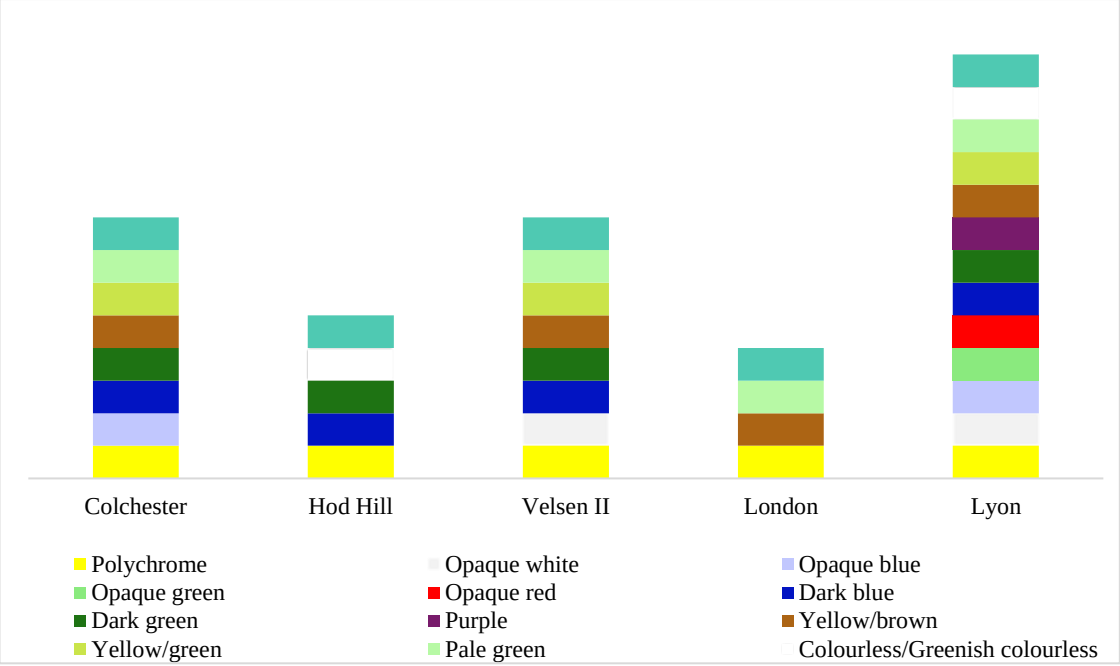


Fig 4.2.10 Colour occurrence in Band A

Lyon can be seen to have the greatest number of individual colours, with much of the difference made up of four rare opaque colours. Opaque monochrome vessels are amongst the most unusual in the Roman repertoire and whilst even in the large assemblage from Lyon they can only be counted in single figures, it is interesting to note the presence of four separate opaque colours. Translucent dark blue and dark green are present in nearly all the assemblages, even if only as single vessels in the smallest groups. Monochrome purple vessels however are particularly rare, only being noted at Lyon, where they rank with the opaque colours in their scarcity of number. Why purple should be so much less common than other translucent colours such as dark blue or dark green is not clear, and possible explanations are examined in more depth in Chapter 6.3.3.

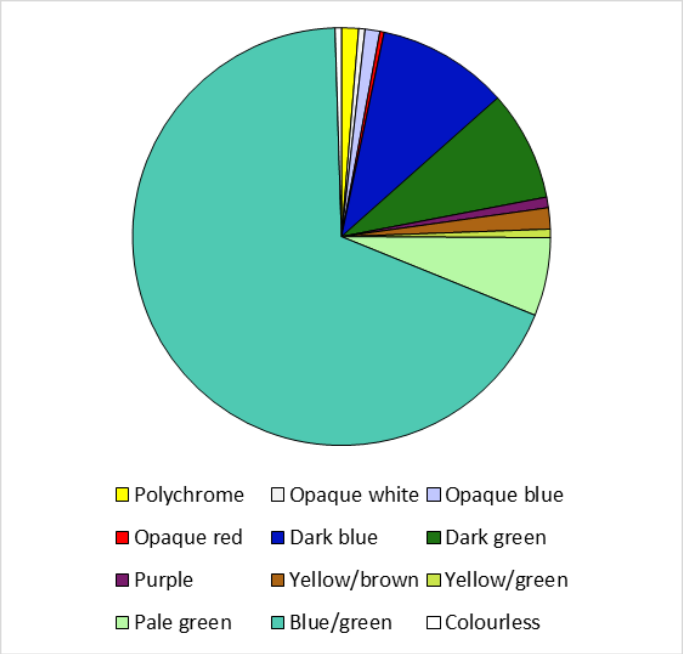


Fig.4.2.11 Colours present at Lyon (Minimum vessels 622)

In band A, Lyon is the only group large enough to give a clear idea of relative colour representation (Fig.4.2.11). The presence of a single olive green fragment is atypical as this is not a colour usually associated with 1st century manufacture. Blue/green vessels dominate the group, accounting for just under 67% of the total. Pale green vessels form a significant minority. Pale green is a difficult colour to classify as the point where it is a considered a greenish/colourless shade is subjective. In this thesis it is considered together with blue/green as a naturally coloured glass, unless there is reason to believe that the vessel has been subject to a deliberate attempt at decolourisation (see Chapter 6.3.5 for a discussion of colourless glass). It is interesting to note the near absence of truly colourless glass in this group.

Polychrome glass is present in all but the very small group from One Poultry, London. In terms of relative representation compared with size of group, Lyon appears to have less polychrome glass than the other assemblages. However, Lyon is the only group apart from One Poultry where full recording of the colours is guaranteed, and the proportions here may well furnish the more accurate picture of the presence of polychrome. The Lyon assemblage shows the greatest variety in the techniques used to produce the polychrome vessels in this selection. There was one fragment of *reticelli* glass, formed from lengths of narrow twisted rods of colourless and opaque white. The specific vessel form could

not be identified, but *reticelli* fragments often come from convex bowls (Isings form 1/18). Two other vessels were formed from fused flattened strips of glass of different colours (blue, opaque white, opaque red, opaque yellow and twisted rods of opaque white and blue). Whilst the form of one of these vessels could not be identified, the other, which incorporated a thin layer of gold leaf within one of the strips, came from the rim and neck of a small flask or unguent bottle. Another strip mosaic vessel comes from Hod Hill, and like most vessels produced by this technique is probably a convex bowl (Isings form 1/18). Both *reticelli* (1 example) and strip mosaic vessels (3 examples) are rare in these groups, and though two further fragments come from slightly later contexts at Colchester, they are only represented in total by a handful of fragments. Vessels with distinct cane sections (either rods, roundels or spirals), or with a 'marbled' appearance form over two thirds of the total. The term 'marbled' was adopted in Harden's 1947 Colchester report to refer to polychrome fragments with a more random arrangement of opaque elements in a darker translucent ground. Many of the fragments here are too small to reconstruct the overall polychrome pattern, but 'marbled' polychrome glass seems to occur when cane sections, perhaps a mixture of rods, roundels and spirals, become less regular during manufacture (Taylor and Hill 2003)

	Reticelli	Strip mosaic	Cane sections	Marbled
Colchester	0	0	2	3
Hod Hill	0	1	1	0
Lyon	1	2	2	3

Table 4.2.9 Types of polychrome non-blown vessels in Band A

Amongst the blown vessels there was considerable variety in the decoration, with features added both at high temperature during the formation of the vessels and in the post-cooling stage. In the first category were a number of polychrome elements such as contrasting blobs/splashes, trails, and a single incidence each of a cased vessel at Hod Hill and a painted/enamelled cup from Lyon. The only form of cut decoration was horizontal wheel-cutting and abrasion, which was noted on vessels from all sites.

	Splashes/ blobs	Cased	Painted	Trails	Ribs	Wheel-cutting
Colchester	2	0	0	3	1	8

Hod Hill	2	1	0	2	0	2
Velsen	0	0	0	0	0	5
London	0	1	0	0	0	1
Lyon	2	0	1	5	2	21

Table 4.2.10 Decoration of blown vessels in Band A

C. Vessel Form

The non-blown vessels from Lyon fall into two groups, ribbed bowls (Isings form 3), or bowls with profiles resembling contemporary ceramic forms. All assemblages in band A except for the tiny group from 15-23 Southwark St, London, produced non-blown ribbed bowls and in most cases they were the most common form. This in part arises from the high visibility of even small fragments because of the combination of glossy outer and polished inner surface, the thickness of the wall and the distinctive ribs. Nevertheless, fragments of this single type occur with much greater frequency than other non-blown vessels (which whilst not always identifiable to the level of specific form, can be easily identified as non-blown items). This was particularly the case at Colchester, which whilst being a much smaller sample than Lyon, produced the same number of ribbed bowls. Across the band they accounted for about half the total of non-blown vessels.

	Ribbed bowl	Convex bowl	'Ceramic' types	Other	Total
Colchester	18	0	?1	2	21
Hod Hill	7	1	0	1	9
Velsen II	9	0	0	0	9
London (One Poultry)	1	0	0	0	1
Lyon	17	1	17	29	64
Total	51	2	18	32	103

Table 4.2.11 Non-blown forms from Band A sites

Only at Lyon were there securely identified examples of the forms described as 'ceramic' types, most notably cups and bowls with a constricted curved profile, and cylindrical cups

and bowls with flat bases (Chapter 2.5.1 nos. 2-4). They occurred mostly in dark green glass, though blues and a few examples in opaque colours were also noted.

The non-blown vessels are predominantly bowls and when the general forms recorded are considered without regard to manufacturing method, it can be seen how they dominate the assemblages. Forms classed as drinking vessels, generally blown vessels, are also very numerous. Vessels for serving and storage are less common. There were 13 jugs from Lyon, described as comparable to the biconical and globular forms of Isings forms 13 and 14, but the pieces are fragmentary and the attribution tentative. Bottles were noted with certainty only at Colchester and London, though at least two rim and neck fragments from Lyon are large enough to be considered as bottles rather than jugs.

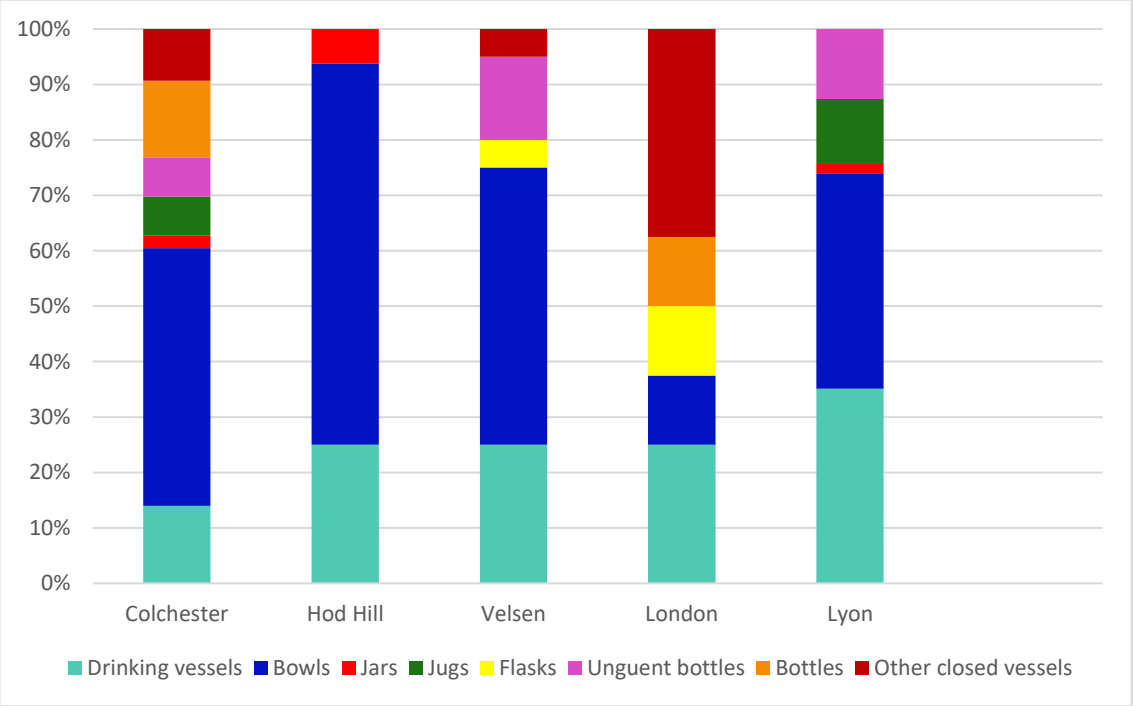


Fig.4.2.12 General vessel forms from Band A sites (as % of total recognised forms)

D. Specific Vessel Forms

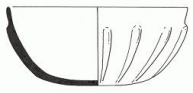
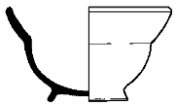
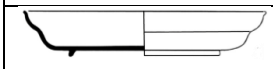
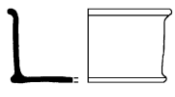
Certain specific forms in band A could be readily identified and are noted here (Table 4.2.12). These are amongst the forms listed in Chapter 2.5 as being the more common forms found in assemblages of the mid-late 1st century A.D.

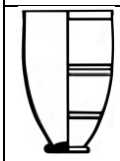
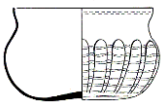
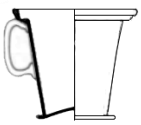
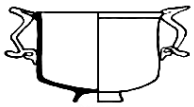
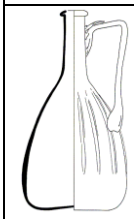
Amongst the non-blown vessels, the high number of ribbed bowls of Isings form 3 has already been highlighted. The most numerous single blown vessel was the wheel-cut cup

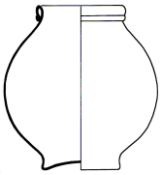
Isings form 12 which occurred at all the sites except One Poultry. It is the prevalence of this form that accounts in large part for the frequency with which wheel-cut decoration was noted in band A. Other specific forms that occurred on more than one site were the ribbed and trailed convex cup Isings form 17 (three examples from two sites) the tall wheel-cut beaker (five examples from two sites) and the tubular rimmed bowl (nine examples from two sites). Blown bowls in general however were very uncommon in comparison with non-blown bowls.

Seven vessels from three sites (Lyon, Velsen and Hod Hill) were identified as possible examples of either canthari or modioli. The distinction is sometimes unclear as both can have wide stepped rims, sometimes incorporating a tubular fold. The modiolus has a single handle, often a small looped ribbon handle, and a tubular base, whereas the cantharus, which can have two handles or sometime none has a separately applied base usually with a stem. The exact function of these vessels is unclear. The form of the rim would not seem to be designed for easy drinking, and the size of vessels might also be considered large for an individual drinking vessel. They certainly appear to be vessels designed for prominent, perhaps individual display, and are often highly decorated. These forms will be considered in more detail in Chapter 5.

Table 4.2.12 Specific vessel forms from Band A

Form	Description	Colchester	Hod Hill	Velsen II	London	Lyon
Non-blown vessels						
	Ribbed bowl	18	7	9	1	17
	Carinated cup					2
	Carinated bowl					10
	Cylindrical cup/bowl					5

	Shallow bowl with base ring	?1				
	Convex bowl		1			1
	Scyphus	?1				
Blown vessels						
	Wheel-cut cup	5	3	5		14
	Wheel-cut beaker with solid base	1				4
	Ribbed cup/bowl	1				2
	Tubular rimmed bowl	2				7
	Cantharus		?2	?1		2
	Modiolus					?2
	Scyphus	1				?1
	Conical jug	1				

	Jar with collar rim					1
	Tubular unguent bottle	2		2		12
	Spherical unguent bottle					1
Bottles						
	Cylindrical bottle	1				
	Prismatic bottle	2		1	?1	

4.3 Band B A.D.50/55-60

4.3.1 Introduction

Band B, spanning five to ten years is entirely made up of sites from Britain, including five from London. This concentration on Britain is due to the historically dated Boudican rebellion of A.D.60/1 which acts as an end-point for the band. Three of the sites were directly affected by the rebellion (Colchester, London and Verulamium) and these assemblages come from contexts lying directly below areas of burning and destruction associated with the revolt. The end of occupation at the two military sites has been linked with the military engagements associated with the rebellion. Again, there is a mixture of civilian and military - Colchester with its status as the first British *colonia*, London an emerging trading centre and Brandon Camp and Waddon Hill as short-lived military installations.

4.3.2 Band B Site Analysis

Colchester; London One Poultry; London Plantation Place; London GPO (Newgate Street); London 5-12 Fenchurch Street; London Borough High Street (Jubilee Line Extension Project); Verulamium; Brandon Camp; Waddon Hill

Colchester (Fig.4.3.1-8)

The group from Colchester comes from the sites featured in band A, two of which lie in the industrial area at Sheepen (Harden 1947; Charlesworth 1985) and the third which includes various parts of the early town. The phasing from Colchester brings up a particular issue which has to be resolved. The final phase identified at Sheepen, Period VI, was described as post Boudican (A.D.61-c.65) and 19 vessels could be placed specifically within it. However, the excavators make it very clear that whilst there was activity for a short period in the early A.D.60s mainly in the form of road re-surfacing, ‘no evidence for post-Boudican occupation was found’ (Niblett 1985, 26). The material from Period VI therefore seems to be re-deposited from earlier phases. For these reasons, Period VI has been included in band B.

Assemblage	Date	Recorded items
Harden 1947 Period III-IV, IV, V, VI	c.A.D.49-61	83
Charlesworth 1985 Period IV, V, VI	c.A.D.49-61	78
Cool and Price 1995 Claudian-early Neronian	c.A.D.50-61	104
Total		265
Production method (excluding bottles)		
Non-blown	73	
Mould-blown	5	
Blown	173	
Colour (excluding bottles)		
Polychrome	44	
Dark blue	14	
Strong greenish-blue	1	
Dark green	14	
‘Black’	1	
Yellow/brown	9	
Yellow/green	10	
Opaque blue	4	
Opaque green	1	
Opaque turquoise	2	
Opaque white	3	
Pale green	3	
Blue/green	142	
Colourless	3	
Greenish colourless	2	
Decoration (blown vessels)		
Ribs	7	
Blobs/splashes	10	
Trails	9	
Painted	1	
Wheel-cut lines	49	

Indents	3
Cased	4
General vessel forms	
Drinking vessel	55
Bowl	88
Jug	25
Amphorisk	5-7
Jar	4-6
Jug/flask	10
Flask	7-9
Unguent bottle	10
Bottle	14

Table 4.3.1 Summary of vessel attributes (minimum numbers) from Colchester c.A.D.49-61

Non-blown vessels form just over 40%, of the total assemblage. Of these the ribbed bowls of Isings form 3 are by far the most numerous single form (Fig.4.3.1), not just amongst the non-blown vessels (45 of the 73 examples), but across the assemblage as a whole. Three examples of the less common variant of this bowl form, with narrow short ribs, were present (Fig.4.3.1.d). Most of these ribbed bowls were natural blue/green, seven were polychrome and four monochrome bowls were deliberately coloured. One unusual polychrome bowl is formed from what appear to be strips of dark blue, yellow/brown and opaque white glass, though it is possible that the elements are cross-sections of large polychrome rods (Fig.4.3.1.a). Also rare is the carefully made opaque white bowl (Fig.4.3.1.c).

There were at least seven convex bowls of Isings form 1/18, of which all but two were formed from polychrome strips or sections (Fig.4.3.2). The fragment of *reticelli* glass (Fig.4.3.2.a) and the strip mosaic fragment (Fig.4.3.2.b) both rare in Roman Britain, probably come from bowls of this type. The other polychrome convex bowls are formed of polychrome mosaic sections (Fig.4.3.2.c-f). Monochrome convex bowls were in the minority, with just two firmly identified examples, one dark green and the other (Fig.4.3.3.a) in an unusually intense dark yellow/brown glass, appearing black.

The ‘ceramic’ forms are not well represented in this band. There is a dark green cylindrical bowl of Isings form 22, and possibly a second (Fig.4.3.3.b and c), and a dark green shallow bowl which has the trace of a base ring (Isings form 5). Two opaque blue fragments may also come from vessels of this group, one from a further cylindrical cup or bowl and the other (Fig.4.3.3.d) perhaps a convex cup or bowl with a constricted convex side (Isings form 2). A third opaque blue fragment comes from a plate or wide bowl with a low base ring (Fig.4.3.3.e).

There were five mould-blown vessels including three cylindrical cups with scenes of gladiatorial combat (Fig.4.3.4.a). A blue/green mould-blown vessel (Fig.4.3.4.b) is less easy to identify. It was classed as a beaker of Isings form 31 by Charlesworth, on account of the raised boss decoration. The straight side does suggest a cylindrical vessel, but the fragment is too small for the form to be identified. The further fragment (Fig.4.3.4.c) has vegetal motifs and narrow oval gadroons above at least two horizontal cordons.

The 24 blown vessels with polychrome decoration are interesting for the variety of forms recorded. These include cups, larger drinking/serving vessels such as canthari (Fig.4.3.5.e-h) and a possible modiolus (Fig.2.11.28) as well as bowls, jugs, flasks and a jar. Five of the vessels are ribbed bowls of Isings form 17 (Fig.4.3.5.b-d). There is a single cased fragment from a cup of Isings form 12 (Fig.4.3.5.a) which has an uncommon combination of translucent dark green and opaque white. A very small fragment from a vessel of unknown form has painted/enamelled decoration, with part of a wreath in yellow and reddish brown.

Two monochrome vessels with stepped rims were also identified as canthari, bringing the total for this form to six. The most numerous monochrome blown vessels were cups with horizontal wheel-cutting of Isings form 12 (Fig.4.3.6.a-b). Beakers with wheel-cutting and indents were also recognised (Fig.4.3.6.c-d). There is very little colourless glass in this group, but one cylindrical cup stands out for the both the clarity of the colourless glass with which it was made and the care taken over its wheel-cut decoration and rim finishing (Fig.4.3.6.e). There were several tubular rimmed bowls and fragments of a blue/green scyphus, one of the few blown tablewares with a fire rounded rim (Fig.4.3.6.f).

Whilst there are at least 24 jugs recorded, very few can be identified more closely. Two are certainly from conical jugs. A further jug is signalled by the dark blue moulded medallion with the image of a young man, perhaps Bacchus (Fig.4.3.7.a) and a yellow/brown body and base fragment may be from another (Fig.4.3.6.f). At least five amphorisks were identified (Fig.4.3.7.c-e), all from the same pit (Site 1, pit 102). This pit also contained substantial portions of other glass vessels, including the polychrome canthari above (Fig.4.3.6.e & g).

At least three different shapes of unguent bottle were recognised, tubular, ovoid and conical (Fig.4.3.8). Bottles were not well represented, with only 14 fragments present.

London, One Poultry, Period 202 (Fig.4.3.9)

Period 202 at One Poultry sees further development in the area west of the Walbrook stream, including evidence of timber roadside buildings. The character of the area seems to have been commercial and storage related, with a possible tavern and shop (Hill and Rowsome 2011, 291-305). All the timber buildings in the area were burnt and destroyed, probably in A.D.60/1 as a result of the Boudican uprising.

Assemblage	Date	Recorded items
One Poultry, Period 202	c.A.D.55-60/1	24
Production method (excluding bottles)		
Non-blown	2	
Blown	19	
Colour (excluding bottles)		
Polychrome	1	
Dark blue	1	
Dark green	1	
Yellow/brown	1	
Yellow/green	1	
Blue/green	16	
Decoration (blown vessels)		
Wheel-cut lines	2	

General vessel forms	
Drinking vessel	2
Bowl	2
Jug	1
Jug/flask	1
Jar	1
Flask/bottle	1
Unguent bottle	1-2
Bottle	4

Table 4.3.2 Summary of vessel attributes (minimum numbers) from London, One Poultry Period 202

Slightly more glass is recorded from this phase, but it remains a small group. Nevertheless, the identified vessels can be assigned to a range of functions, even if in most cases there are only one or two examples of each form. The specific tableware forms identified are commonly found types; a polychrome ribbed bowl of Isings form 3 (Fig.4.3.9.a) and a wheel-cut cup of Isings form 12 (Fig.4.3.9.b). A further blue/green beaker with a curved rim and straight side (Fig.4.3.9.c) does not correlate exactly with common contemporary drinking vessel forms. Only one jug with a pinched 'thumb rest' at the top of the handle, was identified with certainty (Fig.4.3.9.g). It is interesting to note that storage vessels such as jars, unguent bottles and bottles (Fig.4.3.9.d-f and h) outnumber tablewares in this assemblage. Six colour categories were present, but there was only one polychrome vessel. Decoration of the blown tablewares was limited to two instances of horizontal wheel-cutting.

London, Plantation Place, Period 2 (Fig.4.3.10)

The earliest activity at Plantation Place appears to be the construction of timber framed buildings along an east-west road, though complete plans were not recovered (Brigham 2001). More substantial buildings were built and occupied from c.A.D.50-60 and the associated material suggests they were principally domestic, though some craft activities may have taken place. Evidence of a major fire, interpreted as the result of the Boudican uprising of A.D.60/1, was noted across part of the area.

Assemblage	Date	Recorded items
Plantation Place Period 2	A.D.48-63	46
Production method (excluding bottles)		
Non-blown	2	
Blown	39	
Colour (excluding bottles)		
Polychrome	1	
Dark blue	5	
Dark green	3	
Yellow/brown	1	
Yellow/green	2	
Blue/green	27	
Decoration (blown vessels)		
Indents	1	
General vessel forms		
Form	Number recorded	
Drinking vessel	1	
Bowl	3	
Jug	2	
Flask	3?	
Unguent bottle	5	
Bottle	5	

Table 4.3.3 Summary of vessel attributes (minimum numbers) from London, Plantation Place Period 2

The number of identifiable vessel forms is limited, given the size of the assemblage. Tablewares are strongly outnumbered by storage vessels. There is one polychrome fragment, from a large dark blue blown vessel decorated with opaque white splashes (Fig.4.3.10). This has been tentatively identified as a modiolus, though there is no handle. The angle of the upper body, the folded rim and the rim diameter (at c.140mm, small for a bowl) support this interpretation. Strongly coloured tablewares form about a quarter of the total, with dark blue being particularly well represented. A small blue/green body

fragment, probably from a beaker, is decorated with indents. Unusually, no horizontal wheel-cut decoration was noted on the blown tablewares. The number of unguent bottles (5 examples) is relatively high compared with other sites in this band.

London, GPO (Newgate Street, Period 3) (Fig.4.3.11)

The earliest structure at this site is a circular building, alongside evidence of quarrying. Draining ditches were dug in period II followed by timber framed rectangular buildings in period III and further circular huts. These buildings were destroyed by fire in an event equated with the Boudican destruction of A.D.60/1 (Perring and Roskams 1991, 3-6).

Assemblage	Date	Recorded items
GPO (Newgate Street) Period 3	A.D.50/5-60	6
Production method (excluding bottles)		
Non-blown	1	
Mould-blown	1	
Blown	3	
Colour (excluding bottles)		
Yellow/green	1	
Blue/green	4	
Decoration (blown vessels)		
Wheel-cut lines	1	
General vessel forms		
Form	Number recorded	
Drinking vessel	1-2	
Bowl	1	
Jug/flask	1	
Bottle	1	

Table 4.3.4 Summary of vessel attributes (minimum numbers) from London GPO (Newgate Street)

Very little glass was recovered from these early levels. A non-blown ribbed bowl and a wheel-cut cup, or possibly a beaker were two common forms identified. There is a

possible example of a blue/green mould-blown cup with a raised horizontal cordon, though precise identification is not possible (Fig.4.3.11).

London, 5-12 Fenchurch Street (Fig.4.3.13)

The first activity at this site, east of the Walbrook stream in the city of London, seems to date to c.A.D.50 (Hammer 1985). The three earliest phases all ended with destruction along with traces of fire damage, the thickest fire debris coming at the end of period 3. It is not clear how or if any of these burnt layers might relate to the destruction that occurred during the Boudican revolt, however, period 4, a time of major reconstruction, is dated to the early Flavian period. With this in mind, it is possible to describe the assemblage from periods 1-3 as at least pre-Flavian, and perhaps pre-Boudican.

Period	Date	Recorded items
1-3	c.A.D.50-c.A.D.60	49
Production method (excluding bottles)		
Non-blown	7	
Blown	36	
Colour (excluding bottles)		
Polychrome	2	
Dark blue	2	
Dark green	1	
Yellow/brown	2	
Yellow/green	1	
Pale green	1	
Blue/green	33	
Decoration (blown vessels)		
Splashes	1	
Wheel-cut lines	4	
General vessel forms		
Drinking vessel	4	
Bowl	8	
Jug	7	
Jug/flask	2	

Unguent bottle	3
Bottle	6

Table 4.3.6 Summary of vessel attributes (minimum numbers) from 5-12 London Fenchurch Street

The most common single form is the non-blown ribbed bowl (Isings form 3) all of which are blue/green. The non-blown polychrome convex bowl (Fig.4.3.13.a) has an unusual combination of yellow/brown and opaque yellow (Fig.4.3.2.c). The final non-blown form is a type recognised at Longthorpe and Lake Farm in band C, an undecorated convex bowl (Fig.4.3.13.b) which is similar in some respects to the non-blown ribbed bowls in that it has a glossy outer surface and polished inner surface.

The blown glass shows strong similarities with the other groups in this band. Wheel-cut cups and a beaker of Isings forms 12 and 34 are present (Fig.4.3.13.d). One fragment of polychrome glass comes from the neck of a jug (Fig.4.3.13.c). There are three unguent bottles, one of which, is quite well preserved (Fig.4.3.13.e).

London, Borough High Street, Jubilee Line Extension Project (Fig.4.3.12)

The very earliest Roman activity at this site consists of quarry pits, dumps and ditches. Some of the dumped deposits contain domestic waste including lamps, pottery and brooches. The first buildings, of clay and timber construction, appear in period 2, with frontages along the main road. One has been identified as a blacksmith's workshop, part of another as a possible grain store. Many of the buildings of period 2 are covered with a thick layer of burnt material, associated by the excavators with the Boudican revolt of A.D.60/1.

Assemblage	Date	Recorded items
Borough High Street Period 1	A.D.55	8
Borough High Street Period 2	A.D.55-61	22
Total		30
Production method (excluding bottles)		
Non-blown	2-3	

Blown	22
Colour (excluding bottles)	
Dark blue	5
Dark green	1
Yellow/brown	1
Pale green	1
Blue/green	15
Colourless	1
Decoration (blown vessels)	
Wheel-cut lines	1
General vessel forms	
Form	Number recorded
Drinking vessel	2
Bowl	3-4
Jug	2
Jug/flask	3
Jug/flask/bottle	2
Bottle	7

Table 4.3.5 Summary of vessel attributes (minimum numbers) from London, Borough High Street

Of particular interest in this group is the presence of one or possibly two jugs with pouring spouts (Fig.4.3.12.b), one of which is colourless. The other identified tablewares are more typical of contemporary assemblages – a non-blown ribbed bowl of Isings form 3 (Fig.4.3.12.a), a wheel cut cup of Isings form 12 and a tubular rimmed bowl of Isings form 45 (Fig.4.3.12.c). Amongst the strong colours, dark blue is particularly well represented.

Verulamium (Fig.4.3.14)

Roman activity begins at Verulamium in the later A.D.40s and glass is present from the earliest contexts (Frere 1972, 14). The vessels presented in this table are diagnostic pieces

and is not an exhaustive list of all fragments. It therefore acts as a comparative group rather than one that stands up to detailed statistical analysis.

Period	Date	Recorded items
A	49/50-60/1	6
B	55-61	7
Total		13
Production method (excluding bottles)		
Non-blown	4	
Mould-blown	1	
Blown	8	
Colour (excluding bottles)		
Polychrome	1	
Dark blue	3	
Dark green	2	
Yellow/brown	2	
Pale green	2	
Blue/green	3	
Decoration (blown vessels)		
Wheel-cut lines	4	
General vessel forms		
Drinking vessel	5	
Bowl	4	
Jug	2	
Jug/amphorisk	1	
Jar/jug	1	
Unguent bottle	1	

Table 4.3.7 Summary of vessel attributes (minimum numbers) from Verulamium

The group consist mostly of cups and bowls. Non-blown vessels are represented by ribbed bowls (Isings form 3) and a dark green cylindrical bowl (Isings form 22) (Fig.4.3.14). A

yellow/brown mould-blown cup with scenes of chariot racing is noted by Charlesworth as having been produced from a worn mould (Charlesworth 1984, 150 no.28 Fig.61.14). On the blown vessels, the only decoration noted is horizontal wheel-cutting. Serving and storage vessels are barely present - just one possible amphorisk and a tubular unguent bottle. This absence may reflect documentation bias rather than a true lack of these types of vessels.

Brandon Camp, Leintwardine (Fig.4.3.15)

Roman occupation at Brandon Camp is thought to be short-lived within the earlier Neronian period, probably around A.D.55-60 or just a little later. A hundred and fifty glass fragments were found coming from only eight or nine vessels. The small size of the assemblage supports the thesis that the occupation was short lived, and the large number of fragments retrieved from just eight or nine vessels indicates that little or no cullet retrieval was taking place.

Assemblage	Date	Recorded items
Brandon Camp	c.A.D.55-60	9
Production method (excluding bottles)		
Non-blown	2	
Mould-blown	1	
Blown	6	
Colour (excluding bottles)		
Polychrome	1	
Dark blue	3	
Yellow/green	2	
Blue/green	3	
Decoration (blown vessels) none noted		
General vessel forms		
Drinking vessel	0	
Bowl	3-4	
Jug	1	
Amphorisk	3-4	

Table 4.3.8 Summary of vessel attributes (minimum numbers) from Brandon Camp

All three types of production are represented, and none of the forms is unusual. There are two non-blown ribbed bowls, one polychrome with opaque yellow spirals and red dots in a green ground and the other dark blue. The polychrome fragment has been re-worked, perhaps to form a counter (Fig.4.3.15.a), and it is impossible to know whether this secondary process took place at Brandon Camp or earlier. There are two other bowls; a mould-blown blue/green body fragment comes from a ribbed bowl and a blown blue/green base fragment may come from a tubular rimmed bowl. The lack of cups or beakers in the group is interesting, as is the relatively large number of amphorisks, one formed from 98 fragments (Fig.4.3.15.c).

Waddon Hill (Fig.4.3.16-20)

The fort at Waddon Hill is thought to have been occupied for about a decade in the late Claudian/early Neronian period (Webster 1979, 53-6). The glass was very well preserved and in a number of cases several fragments could be identified as coming from the same vessel.

Assemblage	Date	Recorded items
Waddon Hill	c.A.D.50-60	37
Production method (excluding bottles)		
Non-blown	46	
Blown	68	
Mould-blown	?1	
Colour (excluding bottles)		
Polychrome	23 (min 5 vessels)	
Dark blue	20 (3 vessels)	
Opaque pale blue	9 (2 vessels)	
Yellow/brown	17 (4 vessels)	
Blue/green	42	
Decoration (blown vessels)		
Ribs	2-3	

Wheel-cut lines	4
Trails	3
General vessel forms	
Drinking vessel	3
Bowl	10
Jug	1
Jar/jug	1
Flask	2
Unguent bottle	1

Table 4.3.9 Summary of vessel attributes (minimum numbers) from Waddon Hill

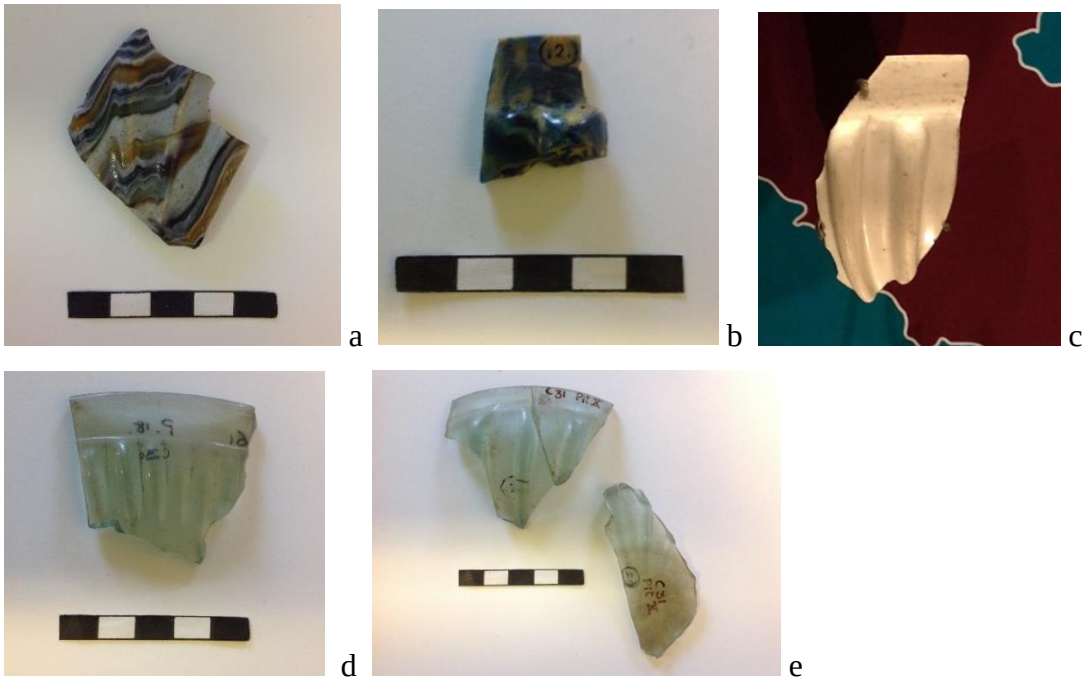
Drinking vessels and bowls considerably outnumber serving and storage vessels and the lack of bottles is unusual. Amongst the non-blown vessels, ribbed bowls are the most numerous single type (Fig.4.3.16). Two are polychrome, one of which is a particularly carefully produced vessel with large opaque white spirals in a yellow/brown ground (Fig.4.3.16.a).

There are several opaque blue fragments (Fig.4.3.17) from a minimum of two non-blown vessels. A convex body fragment with a ground ridge (Fig.4.3.17.a) may come from the same vessel, perhaps a carinated cup (Isings form 2). A second opaque blue fragment, with evidence for a change of angle, may also come from a cup of this type (Fig.4.3.17.b). Two blown polychrome vessels are certainly from ribbed bowls of Isings form 17 (Fig.4.3.18.a and b). A purple base fragment with an opaque white spiral trail may also come from a ribbed bowl (Fig.4.3.18.c).

Four vessels can be identified as cups with horizontal wheel-cutting (Isings form 12), two yellow/brown and two blue/green (Fig.4.3.19). A blue/green body fragment may come from a mould-blown vessel (Fig.4.3.20.a), but the form is unknown. Perhaps the most intriguing glass items from the site, though not listed in the table above, are two blue/green fragments in poor quality glass with long bubbles and one case dark streaks (Fig.4.3.20.b). The streaked fragment in particular is remeniscent of debris found at Roman glass working sites. There is no further evidence of glass-working at Waddon

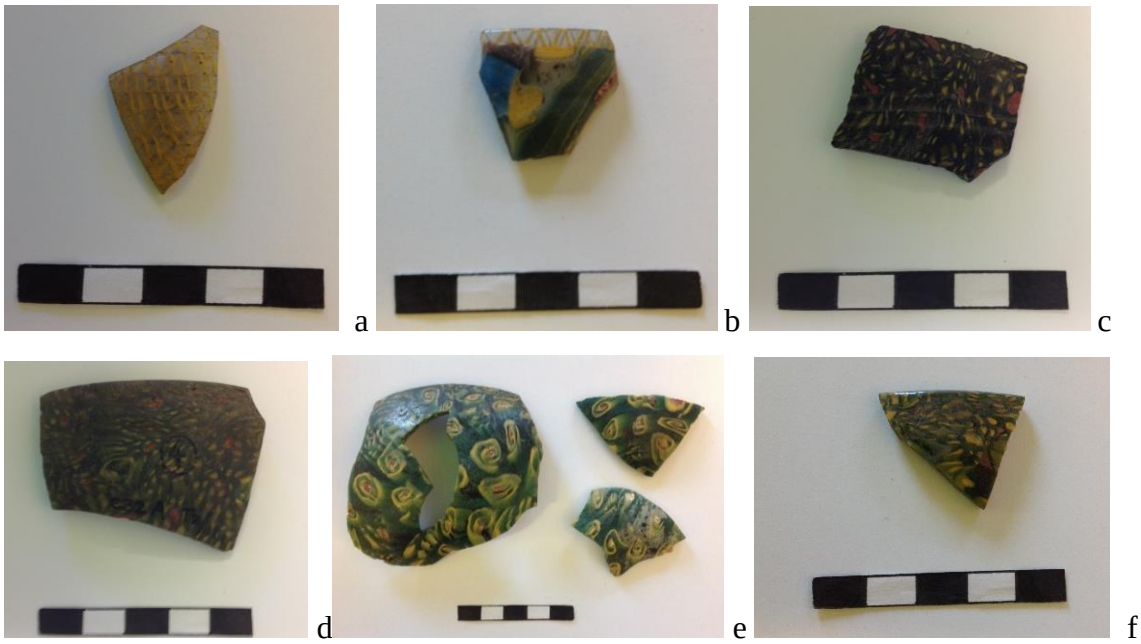
Hill, so at this point the explanation for the occurrence of these pieces must remain uncertain.

Fig.4.3 Vessels from Band B



a b c d e

Fig.4.3.1 Non-blown ribbed bowls from Colchester



a b c d e f

Fig.4.3.2 Non-blown convex bowls from Colchester


a

b

c

d

e

Fig.4.3.3 Non-blown vessels from Colchester

a

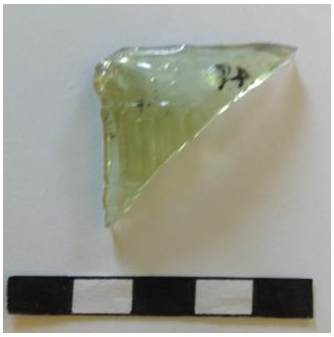
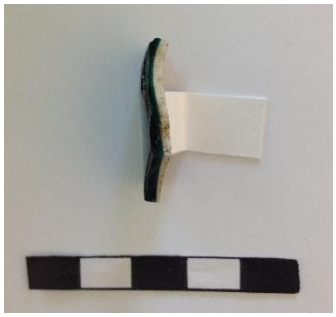
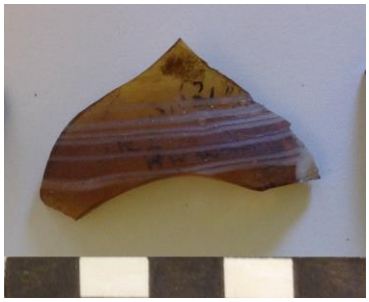
b

c

Fig.4.3.4 Mould-blown vessels from Colchester: a. gladiator cup b. Mould-blown beaker c. Mould-blown cup/bowl


a


b


c


d


e


f


g


h


i


j

Fig.4.3.5 Polychrome blown vessels from Colchester


a


b


c

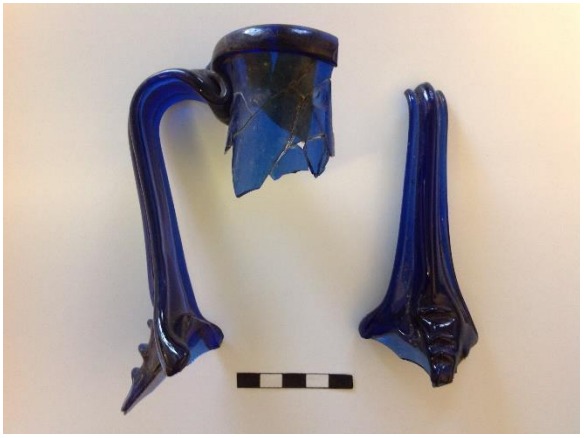

d

e

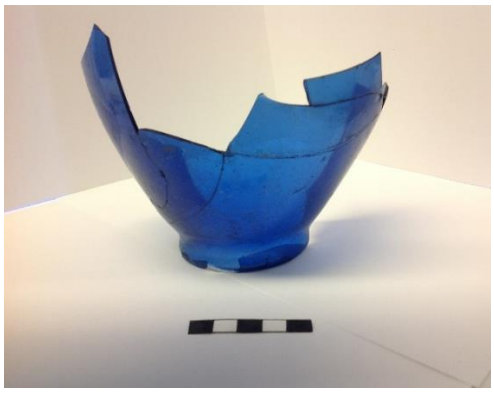
f

Fig.4.3.6 Blown vessels: a-c Wheel-cut cups and beakers, d indented beaker, e colourless cup, f scyphus

a



b



c

d


e


f

Fig.4.3.7 a-e jugs and amphorisks, f. applied base from Colchester


a


b

Fig.4.3.8 Unguent bottles from Colchester

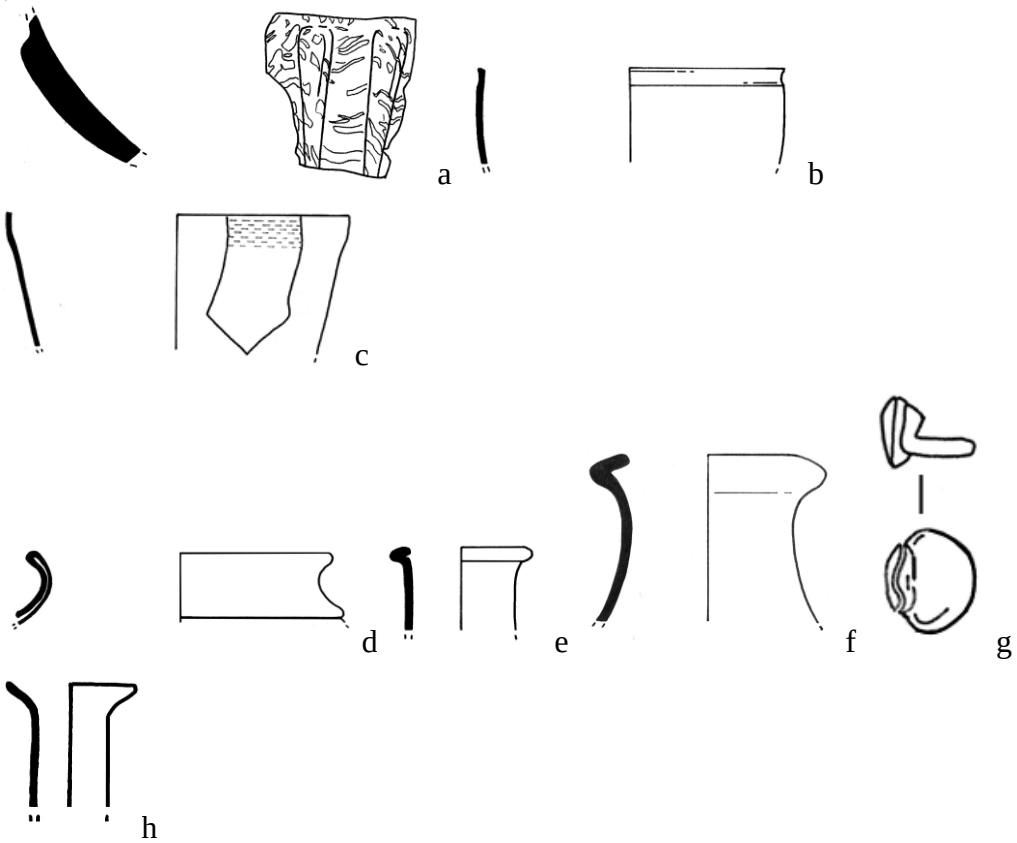


Fig.4.3.9 London, One Poultry, Period 202, a-f 2:1, g-h 1:1

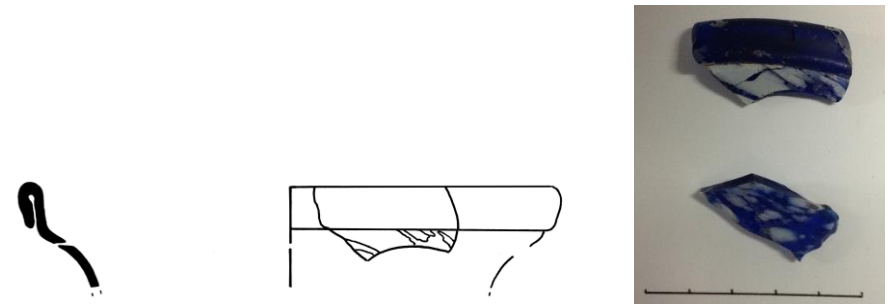


Fig.4.3.10 Glass from London, Plantation Place Period 2, possible modiolus

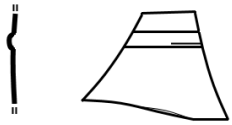


Fig.4.3.11 Mould-blown vessel from London GPO (Newgate Street) Period 3 1:1

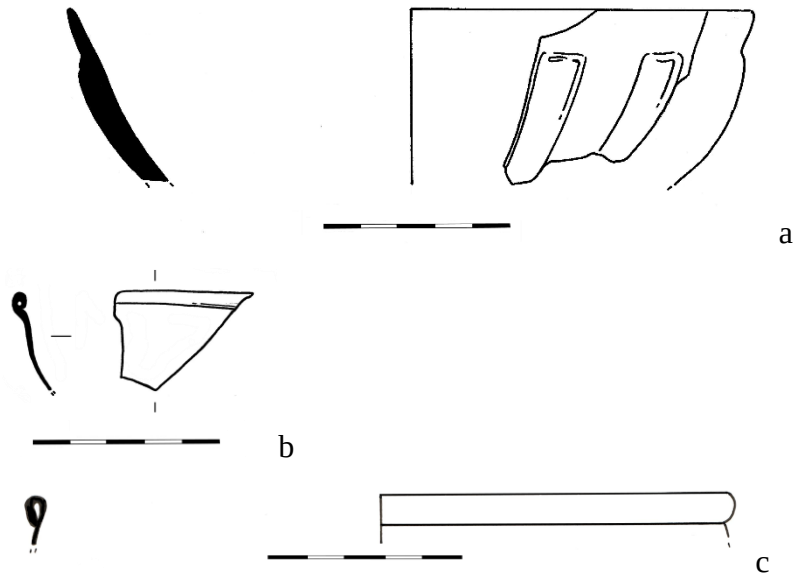
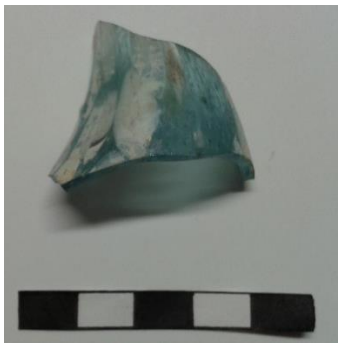
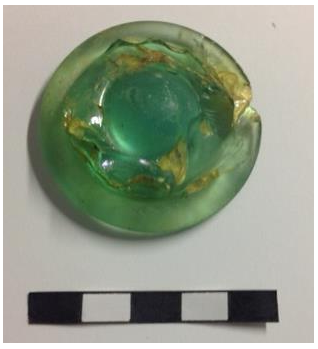


Fig.4.3.12 Vessels from London, Borough High Street, Periods 1 and 2 (Acc. nos.1429, 475 and 877). 2:1


a


b


c


d


e

Fig.4.3.13 Vessels from London, 5-12 Fenchurch Street

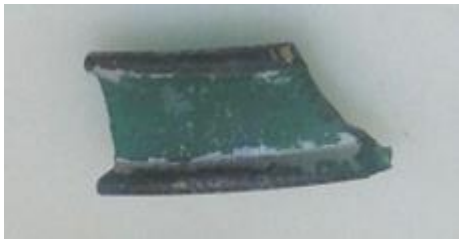


Fig.4.3.14 Glass bowl from Verulamium

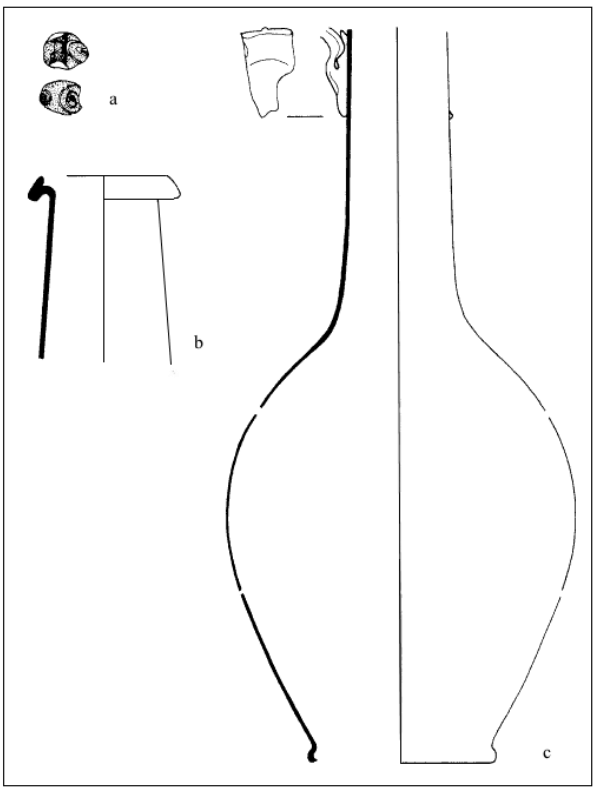


Fig.4.3.15 Glass from Brandon Camp. Reproduced from the original drawing by Jennifer Price and Marion Wilson (Price 1987a, 75 Fig.15)

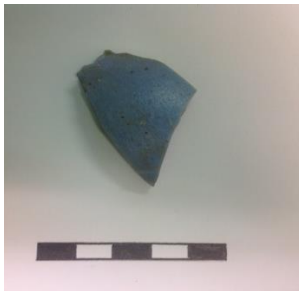

a

b

c

d

Fig.4.3.16 Non-blown ribbed bowls from Waddon Hill, Dorset


a

b

Fig.4.3.17 Opaque glass from Waddon Hill


a

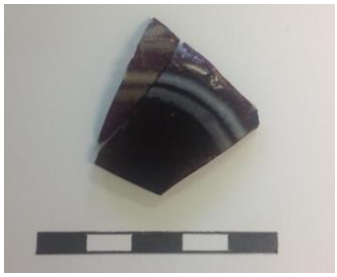
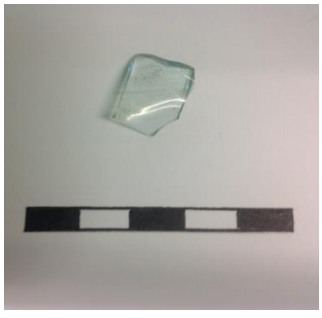
b

c

Fig.4.3.18 Polychrome blown glass from Waddon Hill


a

b

Fig.4.3.19 Wheel-cut cups and beakers from Waddon Hill


a

b

Fig.4.3.20 a. Possible mould-blown vessel b. Possible glass-working debris, Waddon Hill

4.3.4 Review of the Glass from Band B

Ten sites have been brought together in this band, with the glass from Colchester outnumbering the other assemblages by a considerable amount. Whilst Brandon Camp and Waddon Hill had over 70 fragments, the minimum vessel numbers were actually very small (9 for Brandon Camp and 37 for Waddon Hill). The London assemblages have again been grouped together in the following tables, as individually the totals are small, and the sites are geographically very close. With the growth of Roman London there are additional sites producing early glass. Colchester provides the largest group and there is by contrast little glass from securely dated contexts at Verulamium.

A. Manufacture

Blown glass again accounts for the majority of tablewares, with non-blown vessels making up just under a quarter of the total, a rather greater proportion than in band A (Table 4.3.10). This might seem an unusual trend when set in the context of a generally accepted decline in the production of non-blown glass, described by Cool and Price in their overview of glass from Colchester as having 'almost ceased by A.D.60' (Cool and Price 1995, 213). There is again only a very small amount of mould-blown glass (6 vessels).

	Non-blown vessels	Mould-blown vessels	Blown vessels
Colchester (251)	30%	2%	68%
London (132)	12%	1%	87%
Verulamium (13)	33.3%	8.3%	58.3%
Brandon Camp (8)	22.2%	11.1%	66.6%
Waddon Hill (37)	40%	5%	55%

Table 4.3.10 Manufacturing methods in Band B as a proportion of tableware assemblage, using minimum vessel numbers (in brackets)

B. Colour and Decoration

Fig.4.3.21 shows the presence of each colour across the band rather than quantity of fragments in each colour category. As a broad-brush illustration of the range of colours in use it is likely to provide a generally reliable picture. Polychrome glass occurred at each site, forming roughly 16% of the recorded vessels from Colchester. There is every possibility that polychrome glass was preferentially recovered or recorded at some sites (particularly in older excavations). However, a comparison of the band B Colchester group with band A, with the assumption that the recording of glass is similar from one phase to another, shows a very slight fall in the amount of polychrome glass recorded (16% compared to 19%). The range of colours is broadly similar with the notable absence of purple as a monochrome colour, although it does occur as the ground colour for a very small number of polychrome vessels from Colchester and Waddon Hill.

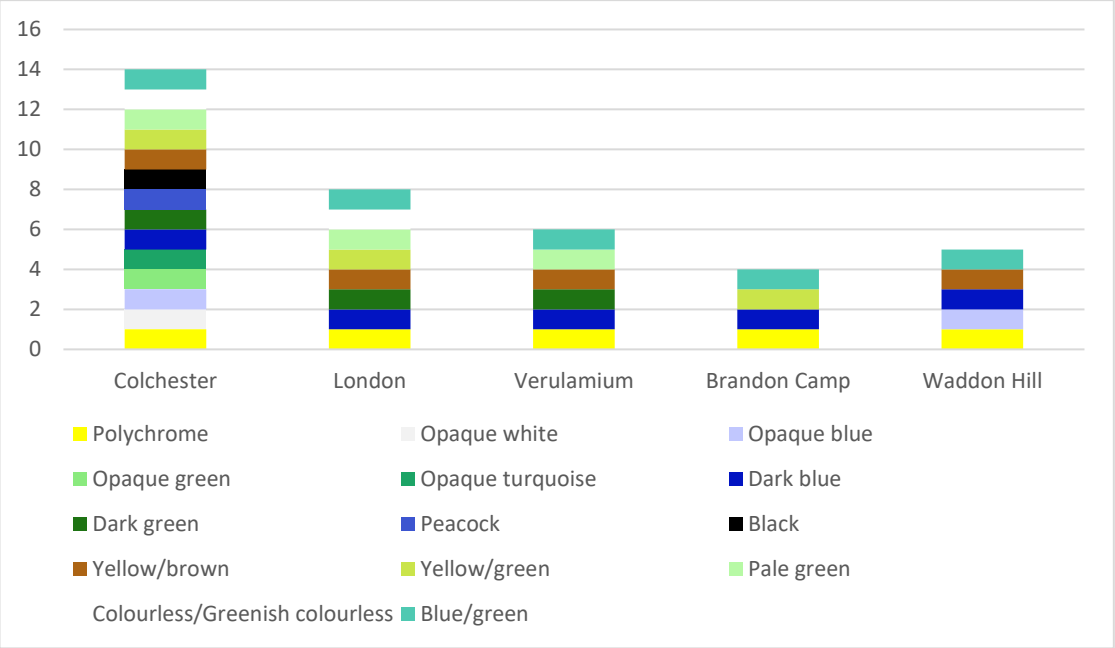


Fig.4.3.21 Colour occurrence in Band B

A single vessel in strong mid-greenish/blue (sometime referred to as ‘peacock’ blue) was noted at Colchester, but not elsewhere. Opaque red is not present as a monochrome colour, but does occur, as in the earlier group, as an element in several of the polychrome non-blown vessels. There is a greater number of opaque colours, largely due to the range of pale blue and green shades that have been defined. Dark blue is significantly more

common than the other monochrome translucent colours with dark green also prominent, though intriguingly absent from Waddon Hill. Monochrome colourless, or near colourless glass is present at London and Colchester, but in very small amounts.

	Reticelli	Strip mosaic	Cane sections	Marbled
Colchester	1	1	10	7
London	0	0	1	0
Verulamium	0	0	0	1
Brandon Camp	0	0	1	0
Waddon Hill	0	0	2	0

Table 4.3.11 Types of polychrome in non-blown vessels in Band B

The type of polychrome non-blown vessels formed from parallel polychrome rods were again very rare in this group, with just one vessel formed from twisted bi-chrome *reticelli* rods and one from polychrome strips, both from Colchester. Only a very small fragment of the strip mosaic vessel survives and it appears to be of a complex construction with seven colours present in this small portion alone.

	Splashes/ blobs	Cased	Painted	Indents	Trails	Ribs	Wheel-cutting
Colchester	10	4	1	3	9	7	47
London	0	0	0	1	0	0	4
Verulamium	0	0	0	0	0	0	4
Brandon Camp	0	0	0	0	0	0	0
Waddon Hill	0	0	0	0	3	2-3	4

Table 4.3.12 Decoration of blown vessels in Band B

The decoration of blown vessels is as diverse as in band A. Polychrome decoration of opaque splashes and blobs on a translucent ground and cased glass was noted at Colchester, occurring in much the same proportion to the vessel total as in band A. The single vessel with painted decoration also occurred at Colchester. The only other examples of polychrome blown glass came from Waddon Hill, where opaque white trails

decorated the convex ribbed cups of Isings form 17. Half of the ribbed vessels recorded are also cups of this form. Monochrome indented vessels appear for the first time at two sites, Colchester and London. Simple wheel-cutting again is by far the most common decorative technique, occurring on a slightly greater proportion of vessels (18%) as it did in band A (13.5%).

C. Vessel Form

The non-blown forms are, as in band A, mainly ribbed bowls of Isings form 3. Here they account for about three quarters of the total number of non-blown vessels, compared with about half in band A. Convex bowls were only recognised at Colchester, where they were a sizable minority in comparison to the absence of the form at the site in band A. Overall ceramic forms were less common, though the number found at the single site of Lyon in band A, where they were as common as ribbed bowls, accounts for this difference.

	Ribbed bowl	Convex bowl	'Ceramic' types	Other	Total
Colchester	45	9-12	1-2	11	65
London	12	1	0	2	15
Verulamium	3	0	1	0	4
Brandon Camp	2	0	0	0	2
Waddon Hill	6	0	?2	0	8
Total	61	7-8	5	12	86

Table 4.3.13 Non-blown forms in Band B

Amongst the blown forms, there is a noticeable trend in favour of closed vessels such as jugs, flask and bottles in comparison with the sites of band A. They occur across all sites and whilst they are less common than open forms at Colchester, Verulamium and Waddon Hill, at several of the London sites they out-number drinking vessels and bowls. Brandon Camp stands out as atypical here for its lack of drinking vessels, but they form roughly 20% of the other assemblages. Bowls outnumber drinking vessels at Colchester and Waddon Hill, but this may in part be due to the high visibility of the non-blown ribbed bowls. Colchester has the widest range of vessel types, as might be expected from the

largest group, but the London sites also show glass being used for a variety of functions, missing only amphorisks as an individual category, a form which can be difficult to identify from other jug types unless an adequate amount of the vessel is preserved. Jars remain very uncommon, only present with certainty at Colchester and London.

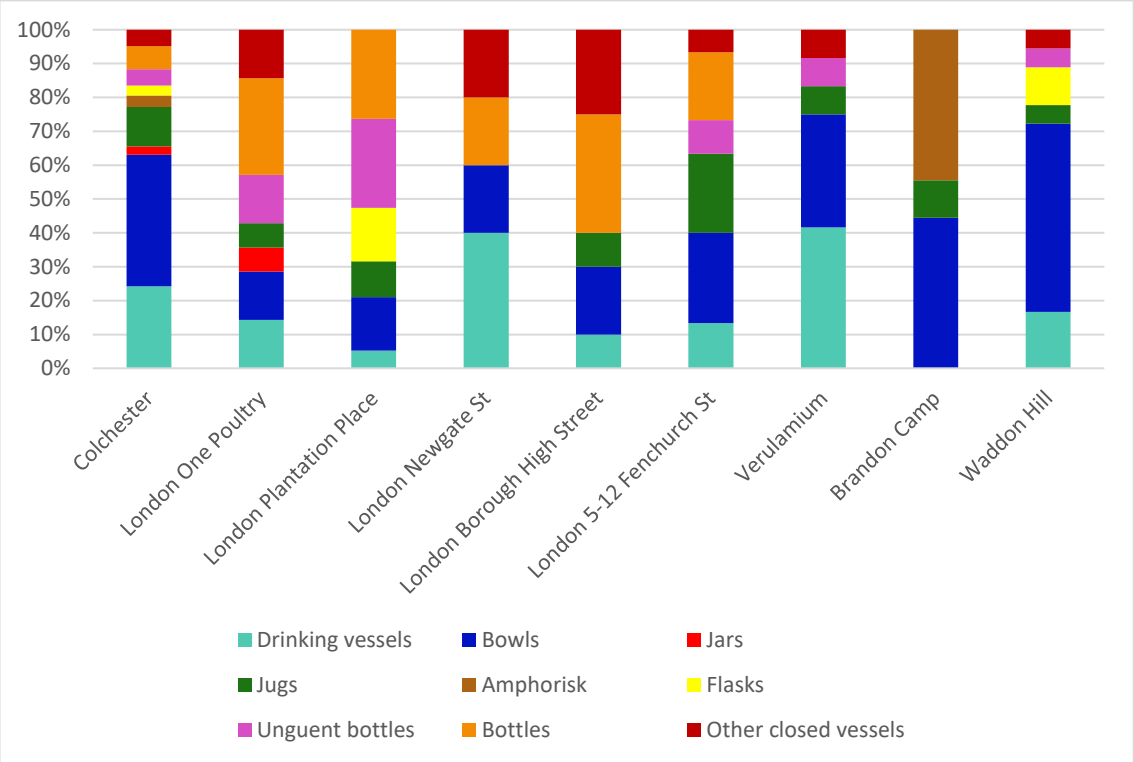


Fig 4.3.22 General vessel forms from Band B (as % of total recognised forms)

D. Specific Vessel Forms

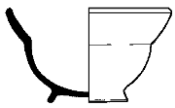
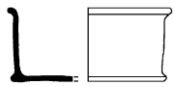
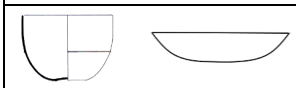
The number of specific forms identified in this band (28 types) compares closely with the number from band A and these are shown in Table 4.3.14. As would be expected, the large Colchester assemblage produced the greatest variety of forms. Colchester was also notable for the high quantity of non-blown ribbed bowls (Isings form 3), which formed nearly 17% of the total vessel assemblage.

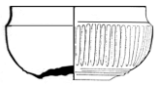
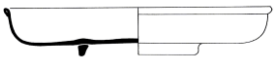
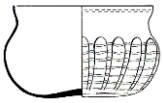
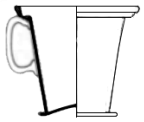
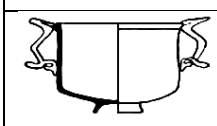
The glass from band B provides the first opportunity to monitor the occurrence of some specific mould-blown tablewares, as the two mould-blown vessels from band A could not be precisely identified. All are open forms, one a bowl, and four are drinking vessels.

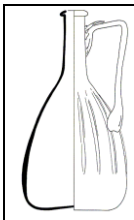
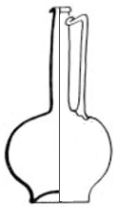
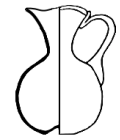
Three were identified as sports cups, showing scenes from the gladiatorial arena and circus. The fact that the circus cup from Verulamium was blown into a worn mould will be examined further, as it may indicate both how popular these cups had become, and whether this particular example might be considered a late product in the lifetime of the form. The blown drinking vessel forms observed in band A occur again here, and are joined by an indented beaker (Isings form 32 and 34). The large blown 'display' vessels noted in band A (for example canthari and modioli) occur again, and this band also sees the production in blown glass of a scyphus, noted in band A as a non-blown form.

Jug forms in band B include a significant number of two-handled amphorisks, which survived in substantial portions at Colchester and Brandon Camp. Another new form in this band is the jug with a pouring spout. Bottles are found in relatively small quantities and are only occasionally the most common single vessel type. Quantification of bottles is notoriously difficult however, as the body is uniform from the shoulder downwards, and so any assessment of minimum vessels often tends to be conservative (Chapter 3.12).

Table 4.3.14 Specific vessel forms in Band B

Form	Description	Colchester	London	Verulamium	Brandon Camp	Waddon Hill
Non-blown vessels						
	Carinated cup					?2
	Cylindrical cup/bowl	1		1		
	Ribbed bowl	45	11-12	3	2	6
	Convex bowl	9-12	1			

	Shallow bowl with base ring	?1				
Mould-blown vessels						
	Sports cup	3		1		
	Ribbed bowl				1	
Blown vessels						
	Wheel-cut cup	24	3-5	4		4
	Wheel-cut beaker with solid base	5-6	1			
	Tubular rim bowl	7-9	1-2		?1	
	Ribbed cup/bowl	5				2-3
	Indented beaker	2	1			
	Cantharus	4-7				
	Modiolus	?1	?1			
	Scyphus	1				

	Conical jug	3	1			
	Globular jug					1
	Jug with spout		2			
	Amphorisk	5-7		?1	3-4	
	Jar with collar rim	3	1			
	Ovoid jar	1				
	Tubular unguent bottle	4	1-2	1		1
	Conical unguent bottle	2	?1			
	Ovoid flask/unguent bottle	2-3	1			
Bottles						

	Cylindrical bottle	2	5			
	Prismatic bottle	3	13			

4.4 Band C: cA.D.43-60

4.4.1 Introduction

This chronological band was created so that material could be included which might not be quite as precisely dated as in the previous two groups, but which nevertheless can contribute important information to this study. It covers the period c.A.D.40-c.A.D.60, spanning bands A and B, focussing on those British sites at which glass use is most unlikely to pre-date the invasion of A.D.43, but which lack closely dated contexts between that date and c.A.D.60. For several sites, the layer of destruction associated with the Boudican rebellion is the next clearly identifiable dated event in the archaeological record. Band C also contributes a considerable amount of glass, particularly from Colchester, to the sample. The arguments for incorporating this glass in the study, despite the wider date range, are strong. Firstly, in archaeological terms refining a period of activity within the Roman period to a span of twenty years is generally regarded as close dating. The sites in this section have been convincingly argued as ending in the early A.D.60s, either on the basis of destruction layers dated to the Boudican rebellion (Colchester and London), coin and ceramic evidence, or support military deployments and consequent site abandonment at much the same period (Cadbury Castle, Lake Farm and Longthorpe). The glass in this band compliments the smaller groups of the previous two bands, as it has a comparable end-date. It expands the assemblages from Colchester and London and brings in three new sites to the sample.

4.4.2 Band C Site Analysis

Colchester; London Paternoster Square; Cadbury Castle; Lake Farm; Longthorpe

Colchester (figs.4.4.1-4)

This group of glass includes fragments from periods II-VI from Sheepen and from pre-Boudican sites within the city.

Assemblage	Date	Recorded items
Harden 1947 Periods II-VI	A.D.49-60/65	50
Charlesworth 1985 Periods II-VI	A.D.43-60/65	117
Cool and Price 1995 Claudian-Neronian	A.D.43/4-60/1	41

Total		208
Production method (excluding bottles)		
Non-blown	60	
Mould-blown	2	
Blown	137	
Colour (excluding bottles)		
Polychrome	38	
Opaque blue	3	
Opaque green	1	
Dark blue	21	
Dark green	10	
Black	1	
Yellow/brown	20	
Yellow/green	5	
Pale green	2	
Blue/green	98	
Colourless	1	
Decoration (blown vessels)		
Blobs and splashes	10	
Cased	3	
Ribs	6	
Wheel-cut lines	14	
Trails	6	
General vessel forms		
Drinking vessel	17	
Bowl	67	
Bowl/pyxis	1	
Jug	17	
Amphorisk	4	
Jug/amphorisk	13	
Jar	2	
Jug/jar	3-4	

Flask	2
Jug/flask	15
Unguent bottle	4
Flask/unguent bottle	2
Other closed vessel	8
Bottle	9

Table 4.4.1 Summary of vessel attributes (minimum numbers) from Colchester A.D.43-60/65

The proportion of non-blown tablewares from Colchester in band C (c.44% of the total) is comparable to the figure from band B, but rather lower than band A (c.60%). Ribbed bowls are again the most common single form (45 examples) and of these 11 are polychrome (Fig.4.4.1.a-c). Several of the polychrome non-blown vessels from Colchester stand out for the quality of their production, particularly a convex bowl (Fig.4.4.1.d) and a carinated cup of Isings form 2 (Fig.4.4.1e) which have both been carefully polished. However, a bowl from Culver Street (Fig.4.4.1.g) was described as uneven on the outside surface, perhaps unpolished or damaged by heat. There is a single small fragment of a polychrome vessel formed from strips of glass (Fig.4.4.1.f). The vessel differs from the strip mosaic bowl from band B as it lacks the twisted cane around the vessel rim and has an out-turned rim, making it an unusual piece (Cool and Price 1995, 29-30 Fig.2.9 no.191). The overwhelming majority of non-blown monochrome bowls are ribbed bowls of Isings form 3 (Fig.4.4.1.j and k), and amongst these, blue/green examples outnumber strong colours by a ratio of 4:1. Other monochrome forms are much less common - there are two dark green convex bowls (Fig.4.4.1.i) and a single dark green carinated cup of Isings form 2 (Fig.4.4.1.h).

Of the three mould-blown tableware fragments, one can be identified as a cup with scenes of gladiatorial combat, the third such vessel from Colchester in this survey. Two other small fragments (Fig.4.4.2.a and b) are from vessels with vertical close-set ribs.

Fifteen blown vessels have contrasting polychrome decoration, either blobs/splashes or trails (e.g.Fig.4.4.3.a-e). In general, the range of polychrome blown forms is similar to that of band B. Closed vessels such as jars, jugs and amphorisks (Fig.4.4.4 i-l) outnumber

open blown vessels, such as cups and bowls (Fig.4.4.4.a-d). The specific forms noted amongst the blown forms are very similar to those seen in band B, with wheel-cut cups the most common type. A blue/green fragment with a rounded edge (Fig.4.4.4.b) may come from the separately blown foot of a stemmed vessel such as a cantharus. Though jugs and flasks feature strongly, fragments of bottles are relatively scarce, particularly cylindrical examples.

London, Paternoster Square Sites, periods 2-3 (Fig.4.4.5)

Paternoster Square (where three adjacent sites produced 1st century glass) lies just inside the western limits of the Roman city. The main east-west road of the early city runs across the northern edge of the site and its establishment has been dated here to c.A.D.50. The earliest Roman activity (period 2) took the form of ditches, quarry pits and gullies along with evidence of waste disposal. The first buildings in the area included some flimsy, possibly temporary structures as well as more substantial clay and timber buildings, perhaps including shop fronts along the main east-west road (Watson and Heard 2006, 15-26). Period 3 covers an episode of fire damage, associated by the excavators with the Boudican revolt.

Period	Date	Recorded items
2 and 3	c.A.D.50-60/1	37
Production method (excluding bottles)		
Non-blown	8	
Mould-blown	1	
Blown	21	
Colour (excluding bottles)		
Dark blue	3	
Dark green	1	
Yellow/brown	2	
Pale green	1	
Blue/green	21	
Colourless	1	
Decoration (blown vessels)		

Ribs	2
Wheel-cut lines	1
General vessel forms	
Drinking vessel	3
Bowl	8
Jug	4
Jug/flask/bottle	3
Jug/jar	1
Unguent bottle	2
Bottle	8

Table 4.4.2 Summary of vessel attributes (minimum numbers) from London, Paternoster Square

Periods 2 and 3 produced 37 fragments of glass. The colour range was quite limited, with no polychrome or opaque glass. A single colourless fragment, possibly a base, is unusual at this early date. There were nine non-blown vessels, seven or eight ribbed bowls of Isings form 3, and one dark green convex bowl (Fig.4.4.5.a). Again, blown bowls were much rarer than non-blown bowls, with just one example of a blown tubular rimmed bowl of Isings form 45. The blue/green mould blown fragment (Fig.4.4.5.b) is very small, but may show parts of a horse's legs from a cup with a scene of chariot racing. The only other drinking vessel form that can be recognised with certainty is a blue/green wheel-cut cup of Isings form 12, but there is also a blue/green cup of unknown form with a fire-rounded rim edge, unusual at this date. Storage vessels such as flasks, bottles and unguentaria (Fig.4.4.5.c) are well represented.

Cadbury Castle (Fig.4.4.6)

A small group of glass is associated with an early post-conquest phase of Roman activity at the site. The identification of a number of rectangular buildings as barracks points to military occupation. Dating is not precise, but the coins and samian assemblages point to a date between the mid-A.D.40s to the A.D.60s.

Period	Date	Recorded items
Single period	cA.D.43-A.D.60s	11
Production method (excluding bottles)		
Non-blown	2-4	
Blown	7	
Colour (excluding bottles)		
Polychrome	3	
Dark blue	4-5	
Yellow/brown	2	
Greenish colourless	1	
Decoration (blown vessels)		
Wheel-cut lines	1	
Trails	1-2	
General vessel forms		
Drinking vessel	1	
Bowl	2	
Jug/amphorisk	2	

Table 4.4.3 Summary of vessel attributes (minimum numbers) from Cadbury Castle

The fragments were small and therefore not all readily identifiable. The most striking feature of this small group is the absence of naturally coloured blue/green glass. The lack of storage vessels, particularly bottles, but also flasks and unguent bottles is also notable. The only non-blown vessels identified with certainty are ribbed bowls of Isings form 3 (Fig.4.4.6.a and b). The blown vessels that could be identified are two dark blue and opaque white polychrome jugs (Fig.4.4.6.c and d). There was one vessel with wheel-cutting, perhaps a cup of Isings form 12 (Fig.4.4.6.f), a vessel with possible painted or trailed decoration and another with unmarvered trails (Fig.4.4.6.e and g).

Lake Farm (Fig.4.4.7)

There is at present no detailed phasing for the military base at Lake Farm, and as such for the purposes of this analysis the glass has to be considered as coming from a single phase. This has been provisionally dated to the Claudian to mid-Neronian period (Grew 1980,

391), but arguments for a foundation date after Hod Hill, and several years after the conquest have been suggested by Sauer, who notes the absence of coins of Caligula (Sauer 2000, 44-49 and 2006, 25).

Period	Date	Recorded items
Single phase	c.A.D.43-A.D.60s	155
Production method (excluding bottles)		
Non-blown	12	
Mould-blown	1	
Blown	132	
Colour (excluding bottles)		
Polychrome	8	
Dark green	5	
Dark blue	15	
Mid blue	2	
Yellow/brown	5	
Yellow/green	3	
Purple	6	
Greenish colourless	2	
Pale green	8	
Blue/green	89	
Decoration (blown vessels)		
Ribs	3	
Wheel-cut lines	8	
Trails	1-2	
General vessel forms		
Drinking vessel	11	
Bowl	14	
Jug	20	
Amphorisk	?4	
Jug/flask	8	
Jar	1	
Other closed vessels	13	

Unguent bottle	4-5
Bottle	3-9

Table 4.4.4 Summary of vessel attributes (minimum numbers) from Lake Farm

The number of non-blown vessels is surprisingly small when compared with the other assemblages in this band. Cadbury Castle for example has just one less non-blown bowl from an assemblage a fraction of the size of Lake Farm. About half the non-blown vessels are ribbed bowls of Isings form 3 (Fig.4.4.7.b), one of which is dark blue and opaque white. Many of the other fragments are too small to be identified securely, but several come from bowls with convex sides, possibly Isings form 1/18. A dark green rim fragment with an out-turned edge and convex upper body may come from a carinated cup of Isings form 2. A non-blown blue/green bowl, similar in profile to convex bowls of Isings form 1/18, has light polishing on the inside surface only, and a dull unfinished outside surface (Fig.4.4.7.a). A similar bowl occurs at Longthorpe.

Strongly coloured fragments were numerous, accounting for nearly 40% of the tableware assemblage. Amongst the polychrome blown vessels there was at least one, possibly two examples of the ribbed and trailed bowl of Isings form 17 (Fig.4.4.7.c), a cased vessel of unknown form and a dark blue jug with an opaque white handle (Fig.4.4.7.d).

Only one fragment of mould-blown tableware was identified, from the base of a wide blue/green vessel, probably a bowl. Blown bowls were again rare, with just one further example, a yellow/brown tubular rimmed bowl (Isings form 45). A blue/green stem probably comes from a vessel with a separately blown foot, perhaps a cantharus. The other blown drinking vessels were nearly all wheel-cut cups of Isings form 12 (Fig.4.4.7.e), with one example of a wheel-cut beaker (Fig.4.4.7.f). Closed serving vessels such as jugs and flasks are numerous although very few exact forms could be identified. Only one certain example of a jar was noted. There are very few bottles, given the size of the assemblage and no cylindrical bottles were identified.

Longthorpe (Fig.4.4.8)

Glass assemblages come from Longthorpe Roman fortress (Longthorpe I) and Longthorpe Military Works Depot (Longthorpe II). The fortress is thought to have been

abandoned by A.D.64, as there are no coins from the bronze issues of that year and an end date of c.A.D.60 has been proposed. A smaller fort was constructed within the original fortress (and confusingly also called Longthorpe II), but it does not appear to be occupied noticeably later than the larger fortress. At the industrial works depot, a large number of pottery kilns were uncovered along with evidence of iron working and possibly bronze-working. The site was considered to be broadly contemporary with the occupation of the fortress (Dannell and Wild 1987, 59-60).

Site	Date	Recorded items
Longthorpe I (fortress)	c.A.D.48-c.A.D.61	14
Longthorpe II (works depot)	c.A.D.48-c.A.D.61	30
Total		44
Longthorpe I and II		
Production method (excluding bottles)		
Non-blown	9-11	
Blown	24	
Colour (excluding bottles)		
Polychrome	3	
Opaque blue	1	
Opaque turquoise	1	
Dark blue	2	
Dark green	3	
Yellow/green	2	
Pale green	5	
Blue/green	21	
Greenish colourless	1	
Decoration (blown vessels)		
Ribs	1	
Wheel-cut lines	4	
Trails	1	
General vessel forms		
Drinking vessel	1	
Bowl	11	

Jug/amphorisk	4
Jug/flask	1
Jug/jar	1
Flask	1
Unguent bottle	1-2
Bottle	4-5

Table 4.4.5 Summary of vessel attributes (minimum numbers) from Longthorpe

Only a small assemblage of glass was recovered from the two sites and very few vessels were represented by more than one piece. Some were very heavily weathered, notably one of the polychrome non-blown bowls (Fig.4.4.8.a). This and the other non-blown polychrome bowl, whilst both having opaque yellow spirals in a dark green ground, are almost certainly separate vessels. The other non-blown vessels were monochrome ribbed bowls (5 or 6 examples; Fig.4.4.8.b) a convex bowl with light polishing on the interior and an unfinished outside surface (Fig.4.4.8.c), and an opaque blue vessel with vertical rim and straight sided body (Fig.4.4.8.d).

There were no mould-blown tablewares from Longthorpe, which is not unexpected in a small assemblage. Much more remarkable is the lack of clearly identifiable blown drinking vessels, particularly wheel-cut cups. Whilst the 1974 Charlesworth report does suggest that a colourless rim fragment might come from a first century cup or small bowl with horizontal cut lines (Charlesworth 1974, 89-90 no.3 Fig.48), inspection of the fragment in connection with this study suggests that it is a more modern piece with the flat smooth appearance of post-medieval window glass.

Fig.4.4 Vessels from Band C

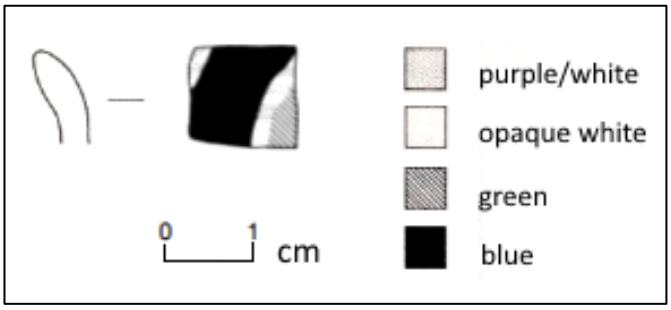

a


b

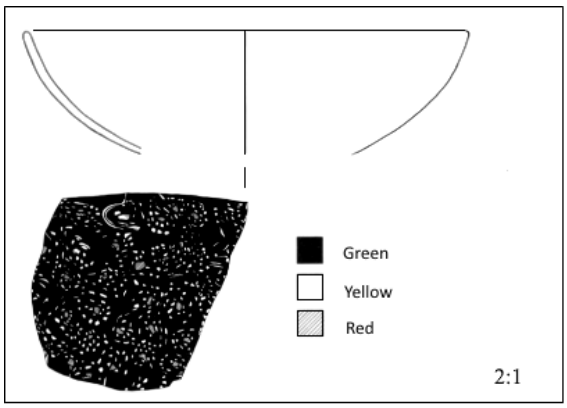

c


d


e

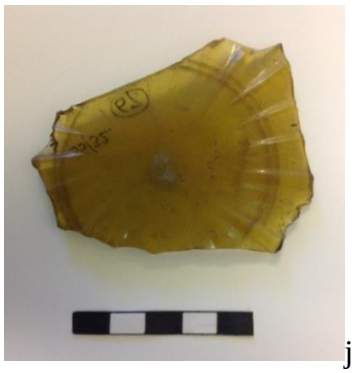


f. (adapted from drawing by D.Fricker)




h

g. (adapted from drawing by D.Fricker)


i

j

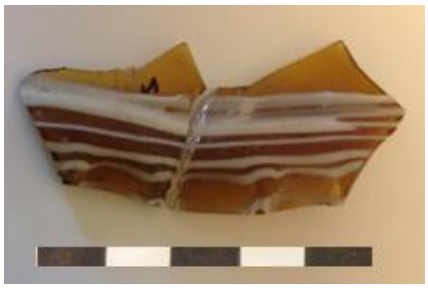
k

Fig.4.4.1 Non-blown vessels from Colchester band C


a

b

Fig.4.4.2 Mould-blown vessels from Colchester band C


a

b

c


d

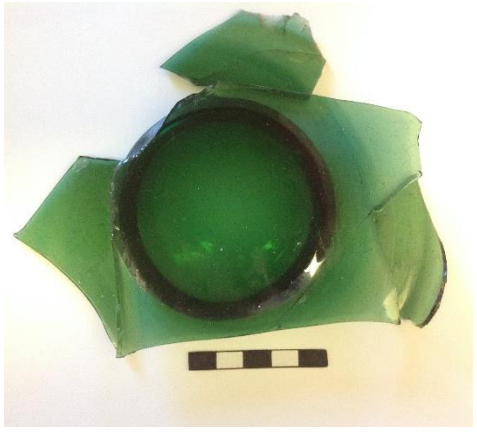

e

Fig.4.4.3 Blown polychrome vessels from Colchester band C


a


b


c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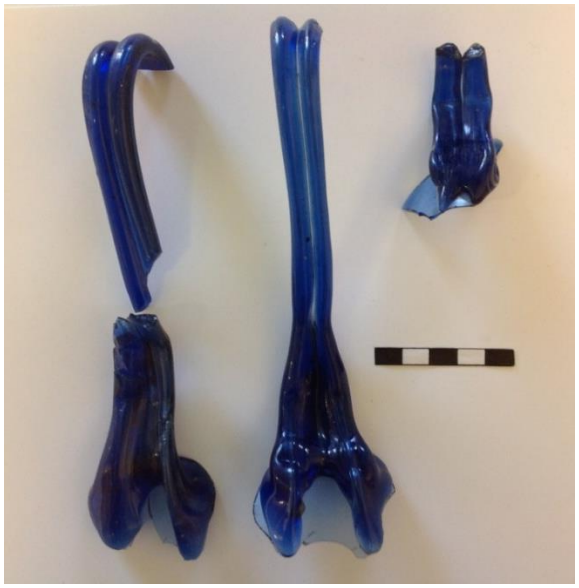
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Fig.4.4.4 Monochrome blown vessels from Colchester band C

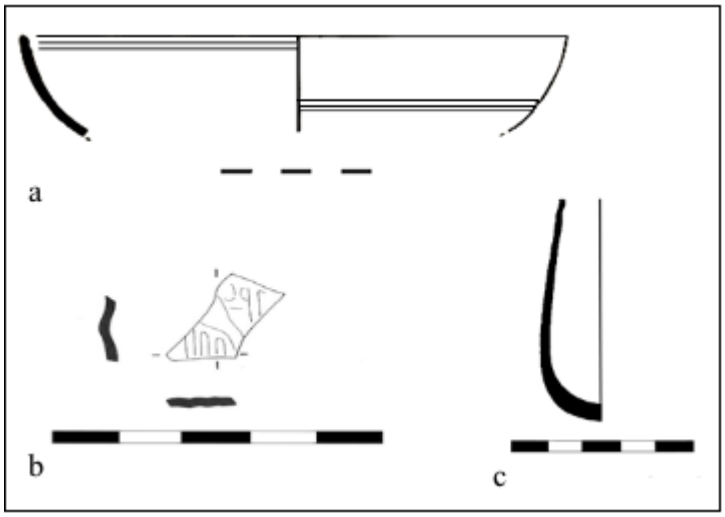


Fig.4.4.5 Vessels from Paternoster Square: a. Convex bowl b.Sports cup c.Unguent bottle (reproduced from Watson and Heard 2006)

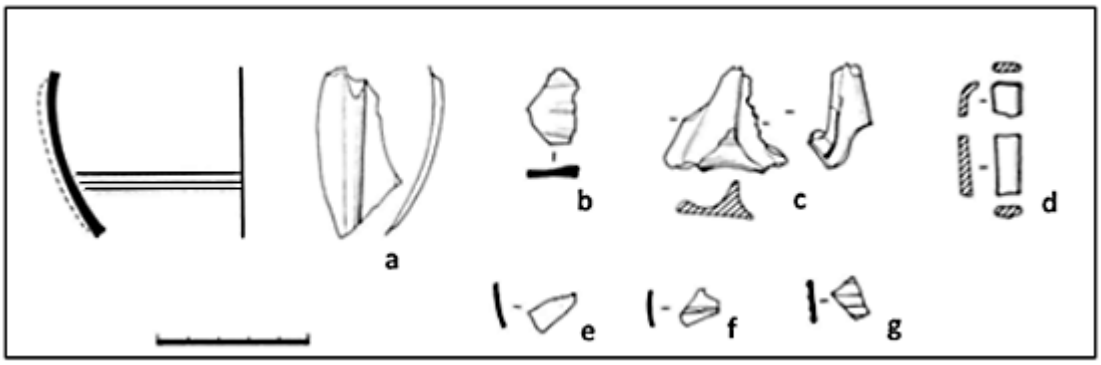


Fig.4.4.6 Vessels from Cadbury Castle, (reproduced from Price and Cottam 2000a)

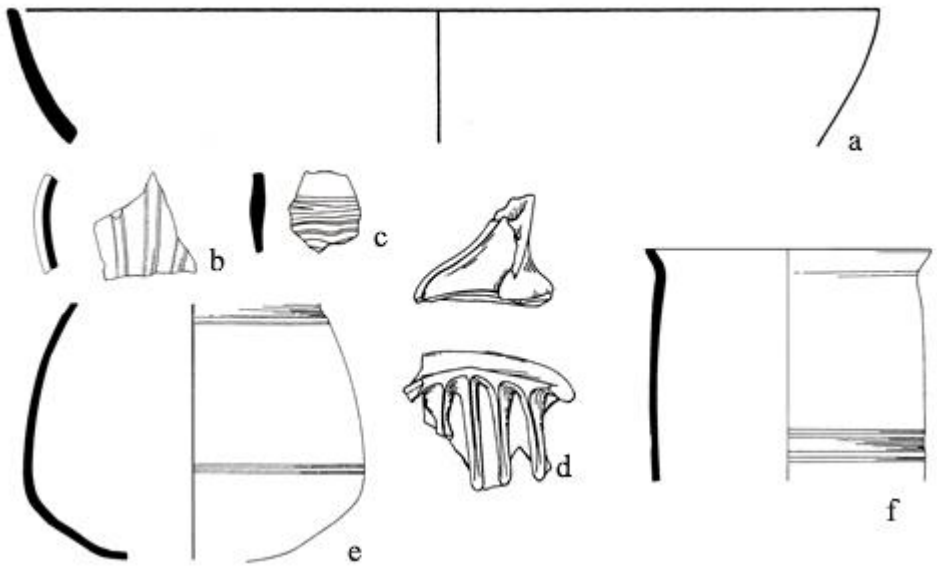


Fig.4.4.7 Vessels from Lake Farm, 2:1

Fig.4.4.8 Vessels from Longthorpe

4.4.3 Review of the Glass from Band C

As would be expected, this group of 455 fragments (about a third of the combined totals of bands A and B), reflects many of the trends seen in the previous two bands and confirms the character of those assemblages, with many of the same colours and vessel forms occurring.

A. Manufacture

Non-blown vessels, though in a minority, still form a significant proportion of the assemblages, with the exception of Lake Farm (Table 4.3.6). Mould-blown vessels are scarce in this band, as they are in bands A and B.

	Non-blown vessels	Mould-blown vessels	Blown vessels
Colchester (199)	30%	1%	69%
London (29)	24%	3.5%	72.5%
Cadbury Castle (11)	36.4%	0	63.6%
Lake Farm (153)	8.3%	0.7%	91%
Longthorpe (40)	31.4%	0	68.6%

Table 4.4.6 Manufacturing methods for tablewares for sites in Band C as a proportion of tableware assemblage, using minimum vessel numbers (in brackets)

B. Colour and Decoration

By far the most common colour was natural blue/green, but a wide range of other colours was present (Fig.4.4.9) The absence of blue/green glass at Cadbury Castle may be related to the small size of that group. Only in the London assemblage was there no polychrome glass. Strongly coloured glass occurs at all sites, with dark blue the most common. Purple was particularly rare, only occurring as a monochrome colour at Lake Farm, although it does feature in a very limited number of polychrome vessels at Colchester. Colourless glass was present in very small amounts, with just a single vessel noted at each site. Only at two sites (Colchester and London) could the vessels be described as truly colourless, with no greenish tinge.

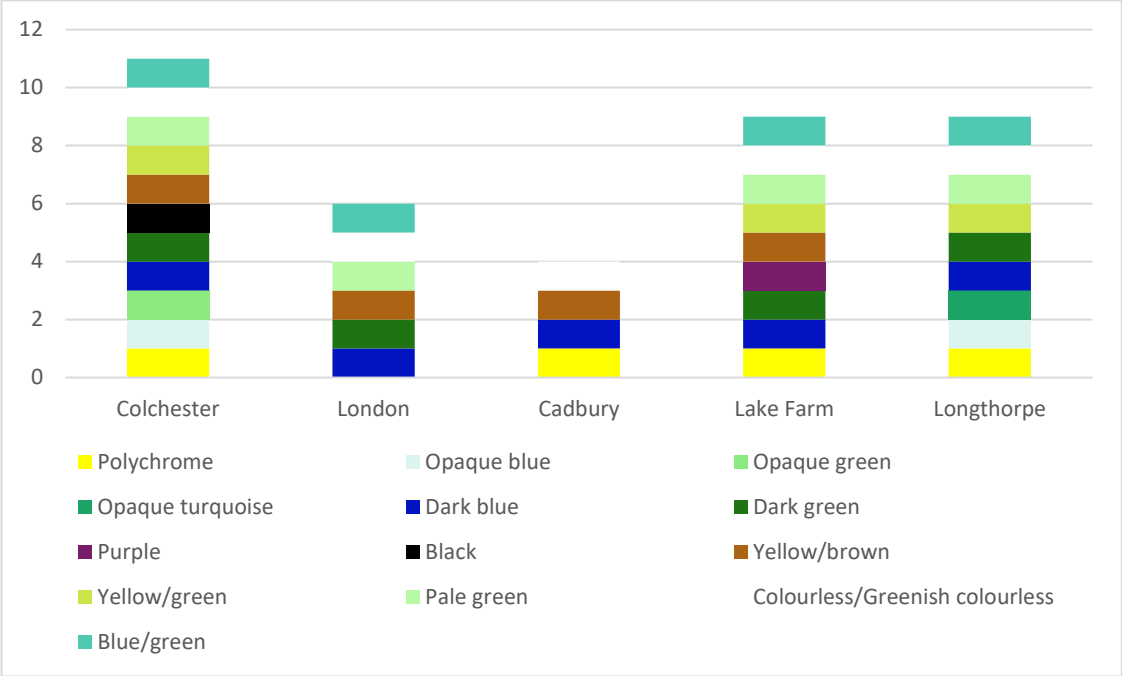


Fig. 4.4.9 Colour occurrence in Band C

Polychrome non-blown vessels occurred at all sites except London (Table 4.4.7). The rarest types again were *reticelli* and strip mosaic vessels, as might be expected from their occurrence in bands A and B and re-enforcing the widely-held opinion that manufacture of these types had ceased by A.D.40 at the latest (Cool and Price 1995, 30)

	Reticelli	Strip mosaic	Cane sections	Marbled
Colchester	0	1	9	8
London	0	0	0	0
Cadbury Castle	0	0	1	0
Lake Farm	0	0	4	0
Longthorpe	0	0	2	0

Table 4.4.7 Types of polychrome in non-blown vessels in Band C

Decoration of blown vessels (Table 4.4.8) showed many of the trends seen in bands A and B, with splashes and blobs the most common polychrome addition, though contrasting trails do occur, mostly on ribbed cup/bowls of Isings form 17. The scarcity of indents on vessels during this period (absent from band A and rare in band B) is re-enforced here.

	Splashes/ blobs	Cased	Trails	Ribs	Wheel-cutting
Colchester	10	3	6	6	14
London	0	0	0	2	1
Cadbury Castle	0	0	1-2	0	1
Lake Farm	0	1	1-2	3	8
Longthorpe	0	0	1	1	4

Table 4.4.8 Decoration of blown vessels in Band C

C. Vessel Form

The non-blown forms are, as in the subdivided bands A and B, dominated by ribbed bowls of Isings form 3 (Table 4.4.9). The occurrence of 'ceramic forms' and convex bowls of Isings form 1/18 also follow a similar pattern to bands A and B. An additional form, noted on two sites, is the convex bowl with a glossy exterior surface.

	Ribbed bowl	Convex bowl	'Ceramic' types	Convex bowl with glossy exterior	Total
Colchester	45	5-7	2-4	0	52-6
London	7-8	1	0	0	8-9
Cadbury Castle	2	0	0	0	2
Lake Farm	8	0	?1-2	1	10-11
Longthorpe	6	1	?1	1	8-9
Total	68-9	7-9	3-7	2	80-87

Table 4.4.9 Non-blown forms in Band C

Figure 4.4.10 shows the relative proportions of eight vessel categories across the band C sites. The assemblage from Cadbury Castle is a particularly small and is included only for general comparison. Only Colchester had examples from all eight categories, which might be expected from an assemblage so much larger than the others. Bowls form the largest single category at all sites apart from Lake Farm. The high incidence of bowls

may be in part related to the easy recognition of body fragments of non-blown ribbed bowls (Isings form 3), whilst other body fragments, particularly from blown forms, are less identifiable. Bowls and drinking vessels make up more than half the recognised forms at three of the sites, but at London, and particularly at Lake Farm, they are in a minority. Flasks are difficult to recognise independently of jugs, and the very small numbers identified probably underestimate the true incidence of the form. Jars however seem genuinely rare in this band. Bottles are most numerous at London, and only form 10% or less of the other assemblages.

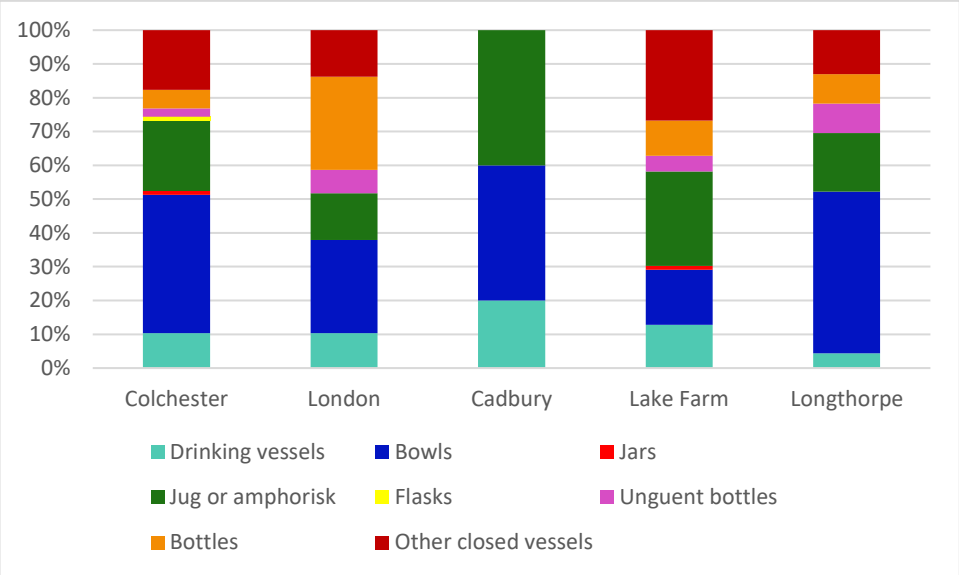


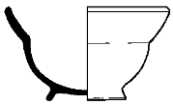
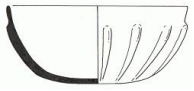
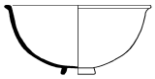
Fig.4.4.10 Relative proportions of vessel categories across Band C (as % of total recognised forms)

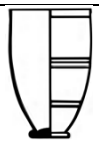
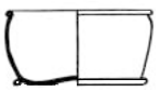
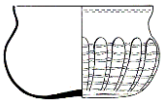
D. Specific Vessel Forms

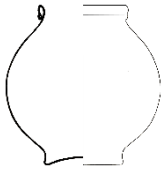
The range of specific forms is, as might be expected, very similar to those found in bands A and B. Non-blown ribbed bowls occur on all sites but are particularly strongly represented at Colchester where they form 21.5% of the total assemblage. As in band B, convex bowls are the next most common non-blown form, though as usual there is some variation in the profile and decoration of examples. Non-blown convex bowls with undecorated glossy exterior surfaces are not a commonly noted form, and only occur twice here. These bowls appear to have been formed by slumping a heated glass disc over a former, in the manner of other convex bowls, though the exterior surface was not polished once cold and the interior surface only received very cursory polishing. Though rare, similar vessels are occasionally noted in 1st century contexts, as at Fishbourne

(Harden and Price 1971, 329 no.16). There are very few of the non-blown 'fine ware' forms (such as the carinated cup), which were identified with certainty only at Colchester, but this compares with the other contemporary sites with the exception of Lyon where they were particularly prevalent. The only recognised mould-blown form was a single sports cup from Colchester. The range of blown forms was very similar to that seen in bands A and B, with cups and beakers decorated with horizontal wheel-cutting the most common forms present. The only additional blown forms are a blown cylindrical bowl and a single discoid unguent bottle.

Table 4.4.10 Specific vessel forms from Band C

Form	Description	Colchester	London	Cadbury Castle	Lake Farm	Longthorpe
Non-blown vessels						
	Carinated cup	2			?1	
	Cylindrical cup/bowl					?1
	Ribbed bowl	45	7-8	2	8	6
	Convex bowl	5-7	1			1
	Convex bowl with glossy exterior				1	1
	Convex bowl with base ring	?1			1	
	Shallow bowl with base ring	?1				
Mould-blown vessels						

	Sports cup	1	1			
Blown vessels						
	Wheel-cut cup	13	1	?1	4-6	
	Wheel-cut beaker	2			1	
	Tubular rim bowl	3-4	1		1	
	Cylindrical bowl	1				
	Ribbed cup/bowl	1			1-2	1
	Cantharus	?1			1	
	Conical jug	2-3	1		1	
	Globular jug	?2			?2	
	Amphorisk	5			?4	?1

	Jar with collar rim	2			1	
	Tubular unguent bottle	1	2		2	1
Bottles						
	Cylindrical bottle	1	3-4			
	Prismatic bottle	6	3		1-3	1

4.5 Band D c.A.D.60- early A.D.70s

4.5.1 Introduction

The assemblages selected for this band include some of the largest groups to be examined. Many are defined chronologically by the events of A.D.69, with intense fire or destruction levels providing an end date (Moers-Asberg, Cremona, Nijmegen, Valkenburg and Xanten). Others have a less exact end point, with the groups from Usk and Eysses for example being dated by the associated ceramic and coin assemblages as well as current thinking concerning the stationing of military units. All the sites have a direct connection with the military except the Piazza Marconi site in Cremona, a townhouse destroyed in A.D.69 after the second battle of Bedriacum, and Southwark Street, London. Five of the sites have been fully recorded (Cremona, Eysses, Usk and Plantation Place and Southwark Street London). The remaining sites have not been seen directly, but the diagnostic fragments from each have been published and illustrated.

4.5.2 Band D Site Analysis

Moers-Asberg; Cremona; Eysses; London Plantation Place; London Southwark Street; Nijmegen; Usk; Valkenburg; Xanten

Moers-Asberg (*Asciburgium*)

Excavation at this auxiliary fort on the Rhine has revealed some areas of burning at the fort dating to the late A.D.60s, but the evidence is not extensive enough to be associated confidently with the events of A.D.69. Furthermore, the fort was occupied after A.D. 69 for another 10-15 years, going out of use by the early A.D.80s. A small group of glass has been identified as coming from contexts generally dated to Kastell IV (van Lith 1987), that is the Claudian-Neronian period.

Period	Date	Recorded items
Kastell IV	Claudian-Neronian	14
Production method (excluding bottles)		
Non-blown	2	
Blown	10	

Colour (excluding bottles)	
Polychrome	2
Dark green	2
Purple	1
Blue/green	7
Decoration (blown vessels)	
Wheel-cut lines	2
Cased	2
General vessel forms	
Drinking vessel	2
Bowl	2
Jug	3
Jar	1
Flask	1
Unguent bottle	1
Bottle	2

Table 4.5.1 Summary of vessel attributes (minimum numbers) from Moers-Asberg

Whilst this is a small group it shows a varied range of vessel types, but a more limited number of colours. This may be because unidentified fragments, regardless of colour, were not catalogued. For this reason, the absence of a particular common colour cannot be assumed as significant. The lack of polychrome non-blown vessels is however probably a true reflection of the assemblage, as these were included elsewhere in the catalogue even if the vessel form was not recognised. No colourless glass was recorded in any context right up to the early A.D.80s. Most of the forms have been noted at sites in bands A-C and D. These include a non-blown convex bowl and cylindrical bowl, a wheel-cut cup and beaker (Isings forms 12 and 34), two canthari, a tubular unguent bottle and square bottles. Non-blown ribbed bowls are absent from this particular group, but are very common in more generally-dated contexts at the fort site.

Cremona (figs.4.5.1-8)

The assemblage from Cremona is one of the most important groups of glass in this study. A substantial burnt layer was discovered during excavations at the Piazza Marconi in the old city and has been associated with destruction following the second battle of Bedriacum in October A.D.69 (Passi Pitcher and Volonté, 2008, 20-1; Arslan Pitcher, 2018). The excavations revealed a large, richly appointed townhouse. Much of the glass appears to have been in use when the house was destroyed as several vessels are substantially preserved, and many are heat-distorted. There was some evidence of later material, including a small amount of 2nd-4th century glass. The deposits containing this later glass have been excluded from this study.

Period	Date	Recorded items
Single phase	A.D.69	536
Production method (excluding bottles)		
Non-blown	48	
Mould-blown	4	
Blown	348	
Colour (excluding bottles)		
Polychrome	5	
Dark blue	26	
Dark green	57	
Purple	1	
Peacock	2	
Opaque blue	7	
Opaque white	2	
Yellow/brown	8	
Yellow/green	18	
Pale green	16	
Blue/green	271	
Colourless	13	
Decoration (blown vessels)		
Ribs	1	

Wheel-cut lines	30
Painted	?1
Trails	1
Indents	1-2
Horizontal fold	2
General vessel forms	
Drinking vessel	40
Bowl	107
Jug	15
Jar	11
Flask	7
Unguent bottle	19
Bottle	109
Other closed vessel	24

Table 4.5.2 Summary of vessel attributes (minimum numbers) from Cremona

There is only a very small group of polychrome non-blown vessels, which might be surprising given the high status of the town house implied by the other finds. These are a convex bowl and a bowl with an out-turned rim, perhaps ribbed (Fig.4.5.1.a and b). Of the other 43 non-blown vessels, over half (24) are ribbed bowls of Isings form 3, most of which are blue green, with just two strongly coloured examples. Very few of the other non-blown fragments came from identified vessel types. There was a possible opaque blue example of a small carinated cup of Isings form 2 (Fig.4.5.2.a). A melted fragment in dark green glass probably comes from a wider bowl with a similar carinated profile (Fig.4.5.2.b). Two further dark green fragments (Fig.4.5.2.c and d). come from bowls with vertical sides and flat bases (Isings form 22). A fragment from a blue/green circular object, with a stepped edge is likely to represent a small cylindrical vessel with a lid, or pyxis (Fig.4.5.2.e). This is a carefully produced item and a rarely recognised vessel form. A fragment of out-turned rim from a small bowl or cup is the only instance of colourless non-blown glass in this group (Fig.4.5.2.f).

There are three or four mould-blown tablewares, two dark blue and one or two dark green. Of particular interest is a blue body fragment, which whilst severely melted could be

recognised as coming from a convex sided vessel with a complex mould-blown pattern consisting of at least two zones of decoration. The lower zone contains close-set vertical gadroons below a horizontal corrugated cordon. Only a small part of the upper zone remains, containing part of an acanthus scroll and three raised dots (Fig.4.5.3.a). The vessel belongs to a rare group of mould-blown tablewares, including handled cups and bowls, jugs and flasks, which occur in mid-1st century contexts (Price 1991a, Lightfoot 2014). Some come from signed moulds with names including Ennion and Aristeas. The other blue mould-blown tableware is also very heat distorted, and appears to come from a straight side vessel, probably a beaker, with decoration divided into zones by a horizontal cordon, the upper containing a winding vegetal scroll, the lower having smaller individual motifs (Fig.4.5.3.b). The further dark green mould-blown cup or bowl has widely-set vertical ribs (Fig.4.5.3.c).

Blown vessels occur in a wide range of colours, but the number of polychrome blown fragments was very limited. Just one certain vessel, a ribbed bowl of Isings form 17, was present (Fig.4.5.4.a). A thin-walled dark green vessel (Fig.4.5.4.b) has roughened patches on the surface that can sometimes indicate painted decoration that has since weathered away. Monochrome blown tablewares from Cremona included several common forms of cup and beaker, including convex cups of Isings form 12 (Fig.4.5.5 a and c) and beakers of Isings form 34 (Fig. 4.5.5.b). The most common single recognised blown vessel form (36 examples) was the shallow tubular rimmed bowl (Isings form 44) which occurred in strongly coloured, pale green and blue green glass (Fig. 4.5.6). Few other blown forms could be identified specifically. There was a high occurrence of tubular bases (9 examples), two of which showed evidence for the application of a pontil, but there was rarely any indication of the form to which they belonged.

Thirteen or fourteen jugs were identified on the basis of handle fragments, but in no case was there evidence of the shape of the body. One rim and neck fragment came from a jug or flask made in dark green glass (Fig.4.5.7.a), a most unusual colour for these closed forms (Jackson and Cottam 2015).

There were very few colourless blown fragments, and only one where the general form could be identified. This was a folded rim fragment probably from a jar, in greenish colourless glass with purple streaks (Fig.4.5.7.b). From this small fragment is not possible

to determine whether the purple is a deliberate effect or the result of imperfect decolourisation using manganese.

This assemblage has a much higher occurrence of bottles than was seen in the previous dated bands. There are at least 108 examples, or about 20% of the vessel glass. Prismatic bottles are the most common, but cylindrical bottles are also well represented (Fig.4.5.8.a and b). Many were clearly in use when the house was destroyed (Fig.4.5.8.a). There were 18 unguent bottles in the group. Of the forms that could be identified, at least five were tubular (Fig.4.5.8.c), and three were possibly conical.

Eysses (figs.4.5.9-4.5.20)

The glass assemblage from Eysses was recovered from a dump of material which included ceramics and coins pointing to a date of deposition of c.A.D.65-72 (Chabrié, Daynès and Garnier 2010, 214).

Period	Date	Recorded items
Single phase	cA.D.65-72	499
Period		
Production method (excluding bottles)		
Non-blown	17	
Mould-blown	21	
Blown	362	
Colour (excluding bottles)		
Polychrome	4	
Opaque white	1	
Dark blue	11	
Dark green	11	
Purple	1	
Yellow/brown	4	
Yellow/green	47	
Pale green	30	
Blue/green	346	

Colourless	14
Decoration (blown vessels)	
Ribs	1
Wheel-cut lines	25
Facets	2-3
Relief cutting	1
Trails	12
Indents	5
General vessel forms	
Drinking vessel	87
Bowl	34
Jug	13
Jar	8
Flask	4
Other closed vessel	4
Unguent bottle/bath flask	9
Bottle	27

Table 4.5.3 Summary of vessel attributes (minimum numbers) from Eysses

The glass from Eysses is fragmentary, with few vessels represented by more than one piece, but it was very well preserved and diagnostic. Non-blown vessels are much less strongly represented than in previous groups, and for the first time are out-numbered by mould-blown vessels, which are particularly prevalent at Eysses. The only non-blown vessels are ribbed bowls (Isings form 3) and the only polychrome vessels in the assemblage are also this form (Fig.4.5.9). Only two of the monochrome ribbed bowls are strongly coloured, one opaque white and the other dark blue (Fig.4.5.10).

The quantity of mould-blown glass at Eysses is unusual as up to this point the number of mould-blown fragments, even in the larger assemblages, has not exceeded single figures. The mould-blown vessels are of three main types. There are at least three, possibly five examples of cups with scenes from the circus (Fig.4.5.11), one of which is very pale

blue/green, almost colourless. Two, possibly three beakers are decorated with mythical figures (Fig.4.5.12.a). One fragment, possibly from a blue/green vessel shows a male figure in a tunic, perhaps Dionysus, holding a thyrsus in his left hand. A second pale yellow/green beaker from the same mould type shows an identical figure and a further yellow/green fragment, perhaps from the same vessel, has part of a bearded face.

Three mould-blown beakers are decorated with tear shaped or 'almond' bosses (Isings form 31), one of the most common motifs on mould-blown beakers (Fig.4.5.12.b). There was at least one more blue/green beaker showing the lower part of a square structure, perhaps an altar, above a double garland of leaves (unavailable to view but published in Chabrié 2010, 148 Fig.1 no.12). Another straight sided fragment has two zones of close-set narrow diagonal ribs (Fig.4.5.13.a). A very small yellow/green fragment from a vessel of uncertain form was decorated with raised triangles and probably comes from a convex or ovoid cup. A blue/green fragment with raised dots above a wide horizontal zig-zag line is unusual in that it has evidence for a handle attachment (Fig.4.5.13.b). The profile of the wall suggests a cup with a straight side and a carination on the lower body.

The final mould-blown fragment is interesting not only on account of its bold and unusual motifs but also in the quality and thickness of the colourless glass from which it is made. (Fig.4.5.13.c). The fragment shows part of a straight sided vessel which has been blown into a mould to produce angled sides. On one side is large oval boss surrounded by a raised oval cordon, and a trace of a second boss. Above is part of another raised curved feature. The form of the vessel is not clear, and no similar vessels are known to me. Comparable decoration is known on a number of colourless mould-blown beakers, but these have indents rather than oval bosses (see for example Cool and Price 1995). The fragment is important in that it represents the use of mould-blowing to create large prominent motifs on a high quality colourless glass vessel.

Many of the blown forms are the common types seen across the assemblages of bands A-D, such as convex wheel-cut cups of Isings form 12 (Fig.4.5.14) wheel-cut beakers, some with straight rims and wide bands of wheel-cutting, others with curved rims (Fig.4.5.15). The small group of colourless glass drinking vessels is particularly significant. These include three or four high quality colourless vessels with cut decoration, at least two decorated with facets (Fig.4.5.16.a) and one other with decorative motifs ground out from

the surface of the vessel and standing in high relief (Fig.4.5.16.b). There are also at least two trailed colourless beakers (Fig.4.5.16.c), two colourless wheel-cut cups and a colourless indented beaker.

These styles of decoration are also seen on blue/green and yellow/green vessels. There are at least seven cups or beakers decorated with curved trails and a further six with indents on the body (Fig.4.5.17). The high tally of drinking vessels in the assemblage is further boosted by the nine tubular bases and seven small concave bases likely to be associated with these forms (Fig.4.5.18). By contrast, there was only a limited number of blown bowl forms. Two had handles, a scyphus and a second bowl of unknown form with a curved handle (Fig.4.5.19). The other recognised bowls were tubular rimmed bowls (Fig.4.5.20).

There were seven jars in the assemblage, three with folded 'collar' rims (Isings form 67b & c), and four with out-turned rolled or fire-rounded rims. The jugs were all recognised on the basis of handle fragments and no specific forms could be identified. Other containers included two bath flasks, one decorated with a distinctive pinched trail extending from the looped handle, directly comparable with the almost complete example from Barzan in band G. Of the seven unguent bottles five were tubular (Isings form 8), and one was conical. Of the identified bottles, the majority (15 examples) were cylindrical and four were square.

London, Plantation Place, Period 301-302 (figs.4.5.21-4.5.22)

This site, between Fenchurch Street and Great Tower Street in the City of London was first analysed in band B. Burnt material associated with a major fire, interpreted as the result of the Boudican uprising of A.D.60/1, was noted across parts of the site (Dunwoodie, Harward and Pitt 2015, 39-56). This assemblage comprises the glass from the levels immediately post-dating this fire, phase 301, described as area preparation, and phase 302, construction and use of post-fire structures. Plantation Place has been identified as the location of a military base, established in the wake of the destruction of London in around A.D.63.

Period	Date	Recorded items
301 and 302	c.A.D.63-cA.D.70	55
Period 301 and 302		
Production method (excluding bottles)		
Non-blown	4	
Mould-blown	1	
Blown	42	
Colour (excluding bottles)		
Polychrome	1	
Dark blue	3	
Dark green	2	
Yellow/brown	1	
Yellow/green	1	
Blue/green	35	
Colourless	1	
Decoration (blown vessels)		
Wheel-cut lines	2	
General vessel forms		
Drinking vessel	1	
Bowl	3-4	
Jug	2	
Jar	2	
Jug/Flask	4-5	
Bottle	8	

Table 4.5.4 Summary of vessel attributes (minimum numbers) from London, Plantation Place Period 301-302

Of the four non-blown vessels, two were ribbed bowls of Isings form 3, one of which was blue/green and one polychrome, with opaque white rods in a yellow/brown ground (Fig.4.5.21). This was the only polychrome fragment in the group. A third non-blown vessel was a deep convex bowl in dark green glass (Fig.4.5.22). The only mould-blown tableware fragment was too small to be identified securely.

The blown fragments were not readily diagnostic. Closed vessels were more numerous than cups and bowls, though there was a single example of a tall beaker with a solid foot (Isings form 34) and a dark green tubular rimmed bowl (Isings form 44/5). A colourless fragment with horizontal wheel-cut lines is likely to come from a cup or beaker. One jug form could be identified specifically, a conical jug with a pinched trail extending down from the lower handle attachment. Bottles formed around 15% of the assemblage, with square bottles the most common form.

London, 15-23 Southwark St, Period 2

This site lies in the London Borough of Southwark, south of the river Thames. In the earliest years of Roman activity in London, Southwark was in a low-lying area of sandy riverside islands. The site would have been on the southern side of the most northerly island, west of the main road south from London (Cowan 1992, 53 Fig.15). Period 2 is defined as 'pre-Flavian' and activity seems to have begun by at least A.D.60. It features four structures, probably of wattle and daub construction. The end of period 2 is marked by the construction of buildings of period 3 which produced timbers felled in A.D.72 and A.D.74 (Cowan 1992, 29).

Period	Date	Recorded items
2	At least A.D.60-c.A.D.74	42
Production method (excluding bottles)		
Non-blown	6	
Mould-blown	1	
Blown	15	
Colour (excluding bottles)		
Dark green	2	
Dark blue	1	
Yellow/brown	1	
Colourless	1	
Blue/green	37	
Decoration (blown vessels)		
Wheel-cut lines	1	

Figure-of-8 fold	1
General vessel forms	
Drinking vessel	1
Bowl	6
Jug	2
Jug/jar	1
Amphorisk/flask/jar	1
Flask/unguent bottle	4
Bottle	6

Table 4.5.5 Summary of vessel attributes (minimum numbers) from London, 15-23 Southwark Street

This small group of glass is dominated by bottle fragments (26), and though a minimum of 6 bottles was identified, the count is likely to be higher. There were two examples of bath flasks, which have not been frequently identified on other sites, and two other flasks or unguent bottles. Only one specific drinking vessel form was identified, a wheel-cut cup of Isings form 12. There were four non-blown bowls, three ribbed bowls of Isings form 3, and a colourless scyphus, or handled bowl. A single mould-blown fragment came from a ribbed bowl. There was no polychrome glass, and only four strongly coloured vessels.

Nijmegen, Kops Plateau

The fort on the Kops Plateau at Nijmegen was occupied in three phases from the Augustan period until the end of the Neronian period, and is widely regarded as having been destroyed in the Batavian revolt. Excavations were undertaken by the Netherlands state archaeology service between 1986 and 1996. Glass from all phases of occupation was published by Sophia van Lith (van Lith 2009) and it is not possible to distinguish glass from the final phase 3 occupation (A.D35/40-c.A.D.69) from the earlier material as stratigraphical analysis and ceramic research has yet to be finalised at the site. Consequently, earlier material may be included here, but the group may provide information about the existence before A.D.69 of vessels and colours (for example colourless glass), usually regarded as more typical of the Flavian period.

Period	Date	Recorded items
Augustan-Neronian	Ending c.A.D.69	131
Production method (excluding bottles)		
Non-blown	54	
Blown	39	
Colour (excluding bottles)		
Polychrome	24	
Dark blue	4	
Dark green	6	
Opaque red	1	
Opaque blue	1	
Yellow/brown	6	
Yellow/green	1	
Blue/green	69	
Greenish/colourless	1	
Decoration (blown vessels)		
Ribs	1	
Wheel-cut lines	26	
Cased	2	
Specks and splashes	3	
Painted	1	
Trails	4	
General vessel forms		
Drinking vessel	1	
Bowl	55	
Jug	6	
Jug/flask	1	
Jar	1	
Flask	3	
Unguent bottle	11	
Bottle	18	

Table 4.5.6 Summary of vessel attributes (minimum numbers) from Nijmegen, Kops Plateau

This assemblage is as interesting for what is not present as much as for what is. There is more non-blown tableware glass than blown, but this is very likely to be a result of the choices made for inclusion in the catalogue. The lack of mould-blown glass is however notable, as this certainly would be included in any catalogue of the vessel glass. There is a high percentage of polychrome glass, both blown and non-blown, with a variety of polychrome techniques reminiscent of assemblages from earlier bands. This reflects the broad date of the assemblage and the probable inclusion of earlier glass. The wide range of colours and the presence of opaque colours also compares with earlier groups. One fragment is described as 'almost colourless', but is from an unguent bottle not a tableware vessel. The general absence of colourless tablewares is significant. Ribbed decoration is only present on one vessel, a blown bowl of Isings form 17. Facet-cut decoration and cordons and motifs in high relief are absent.

Usk (Fig.4.5.23)

The glass fragments analysed here come from the pre-Flavian contexts, many of which are pits. The date range is slightly longer than some of the other groups in this band, and it is possible that fragments from vessels in use during the earlier years of the fortress occupation appear in this group. The glass fragments were in good condition but mostly very fragmentary. However, a small number of vessels were unusually well preserved and were recovered in large fragments from pits dating to the end of the fortress period. The reason for this is unclear, but there is no evidence that they formed part of any structured deposit, and their presence is thought to perhaps point to a suspension of recycling during the abandonment of the fortress (Price 1995, 139-140).

Period	Date	Recorded items
Pre-Flavian	Mid-A.D.50s-late A.D.60s	343
Production method (excluding bottles)		
Non-blown	38	
Mould-blown	3	
Blown	123	

Colour (excluding bottles)	
Polychrome	7
Dark blue	11
Dark green	4
Yellow/brown	14
Yellow/green	6
Pale blue	4
Pale green	3
Blue/green	107
Colourless	5
Greenish-colourless	3
Decoration (blown vessels)	
Ribs	10
Wheel-cut lines	25
Indents	3
Cased glass	2
Blobs	2
Raised cordons	1
Arcading	1
General vessel forms	
Drinking vessel	31
Bowl	42
Jug	27
Jug/jar	7
Jug/flask	4
Jar	8
Flask	11
Unguent bottle	30
Funnel/unguent bottle	1
Bottle	179

Table 4.5.7 Summary of vessel attributes (minimum numbers) from Usk

Non-blown vessels formed over 23% of the tablewares, and nearly all were ribbed bowls of Isings form 3. Out of a total of 35 ribbed bowls, three were polychrome (Fig.4.5.23 a and b) and five strongly coloured. Apart from the ribbed bowls, there was also a dark green bowl with a base ring, identified as possibly being from a shallow convex sided bowl (Isings form 5) or a bowl with a constricted profile, a dark blue vessel and a colourless vessel both of unknown form.
Only three fragments of mould-blown vessels came from pre- or early Flavian contexts. One of these was an almost complete pale green ribbed bowl (Fig.4.5.23.e) from a pit belonging to the abandonment phase of the fortress. One other mould-blown fragment can be identified with some precision. It comes from a colourless beaker with a winding vegetal scroll. Amongst the blown vessels there are four in polychrome glass, all combining dark blue with opaque white. The small collection of colourless tablewares includes a fragment with a ground exterior cordon which was identified as coming from a facet-cut beaker, and another beaker with arcaded decoration. A greenish colourless beaker with horizontal wheel-cutting and a small tubular base ring (Fig.4.5.23.c) is an important vessel as it combines several features that illustrate changes in drinking vessel form during this period (see Chapter 5.3.2).

The fact that there are nearly as many jugs as drinking vessels from pre- and early Flavian contexts at Usk is unusual. Conical jugs were particularly numerous (seven examples). Five were decorated with ribs and an impressed medallion mask probably also came from a conical jug (Fig.4.5.23.d). Ribbed decoration also occurred on five vessels identified as either jugs or jars, and appears to have been a popular form of decoration on serving vessels. One globular jug has been reworked around the neck to repair a breakage, indicating that the vessel was thought worth keeping despite being incomplete (Fig.4.5.23.f)

Bottles outnumbered all other vessel categories by a considerable degree. The relative numbers of cylindrical and square bottle fragments suggest that square bottles had become the dominant form during the last years of the fortress. Two square bottles were remarkably well preserved, one of which had the mould inscription ‘Chresimus fecit’ on the underside of the base (Fig.4.5.23.g; RIB, II, 2, 2419.101), a mark also known from Xanten (see below). A conical flask was preserved almost completely (Fig.4.5.23.h).

There was a large group of unguent bottles (Fig.4.5.23.i), 18 of which could be identified as tubular.

Valkenburg

The fort at Valkenburg was built in around A.D.40, though there may have been some brief earlier occupation. A new phase of construction at the camp is thought to have occurred during the command of Corbulo in lower Germany, and phase 2/3 of Valkenburg is dated to around A.D.47. A burnt layer across the fort has been interpreted as testimony of the Batavian revolt of A.D.69 (van Lith 1978/9, 3). This layer effectively seals phase 2/3, but a more refined date within the period c.A.D.47-A.D.69 is not possible, meaning than this assemblage stretches across over twenty years of activity at the site. As with the glass from Kops Plateau at Nijmegen, and Moers-Asberg, it is a useful group to observe whether particular categories of colour, form and decoration which might newly appear at this period are present. The summary below is based upon published diagnostic fragments (van Lith 1978/9) and is not a complete sample.

Period	Date	Recorded items
2/3	c.A.D.47-A.D.69	81
Production method (excluding bottles)		
Non-blown	22	
Mould-blown	3	
Blown	50	
Colour (excluding bottles)		
Polychrome	7	
Dark blue	9	
Dark green	1	
Yellow/brown	1	
Yellow/green	2	
Pale green	4	
Blue/green	50	
Colourless	1	

Decoration (blown vessels)	
Ribs	1
Wheel-cut lines	24
Cut out fold	1
Blobs	1
General vessel forms	
Drinking vessel	28
Bowl	23-4
Jug	11-12
Jug/amphorisk	1
Jar	2
Amphorisk	?1
Unguent bottle	3
Funnel	1
Bottle	6

Table 4.5.8 Summary of vessel attributes (minimum numbers) from Valkenburg

As this group spans over 20 years of glass use at Valkenburg it is unsurprising that forms that featured in the assemblages of band B should also occur here. These include some of the large serving/drinking vessels such as a cantharus and possible modiolus. Whilst the range of strong colours does not include any opaque shades, opaque white glass does feature on two of the blown polychrome vessels as large blobs and a handle extension trail. Blue/green glass however is very dominant.

The three mould-blown vessels are all decorated at least in part by close-set vertical ribs, and one has an upper zone with stylised palmettes, designs often seen on mould-blown vessels of the Claudian-Neronian period (Price 1991a, 76-9). There seem to be no examples of conical mould-blown beakers.

Wheel-cut cups of Isings form 12 are particularly prevalent and it is interesting to note that one of these is described as colourless. The presence of only one colourless fragment, and that in a style of vessel which had been produced for several decades is notable. All but one of the identified drinking vessels come from this type of cup, the other being a

tall wheel-cut beaker comparable to Isings form 34. There are no rim fragments of tubular rimmed bowls, though an applied base on a vessel with a horizontal lower body may be from this type of bowl. This absence is interesting, as these fragments are highly visible in glass assemblages and the form is easily identified.

Most of the jugs were identified on the basis of handle fragments alone, and only three were identified specifically, two conical and one globular. The cataloguing system used did not included body fragments from bottles and the identified numbers will inevitably be lower than at other more fully-documented sites.

Xanten, Vetera I (Fig.8.2.b)

The double legionary fortress of Vetera I at Xanten was probably destroyed in the Batavian revolt of A.D.69. and the site was afterwards abandoned. This gives a precise dated horizon for the glass, though it is clear from other dated materials that the finds assemblage covers an extensive period, probably dating back to the original Augustan occupation of the site. This means that as with the other Rhine forts in this band, the glass is more useful for monitoring the early presence of later 1st century forms. The large group of glass from both inside and outside the fortress has been published (Hanel 1995) and lists diagnostic fragments only.

Period	Date	Recorded items
Single period	Augustan-A.D.69	355
Production method (excluding bottles)		
Non-blown	96	
Mould-blown	2	
Blown	221	
Colour (excluding bottles)		
Polychrome	58	
Dark blue	16	
Dark green	3	
Black	1	

Purple	1
Opaque white	2
Opaque blue	2
Opaque green	1
Yellow/brown	4
Yellow/green	13
Pale green	2
Blue/green	212
Colourless	4
Decoration (blown vessels)	
Ribs	1
Wheel-cut lines	8
Facets	1
Trails	4
Indents	1
Painted	3
Cased	5
General vessel forms	
Drinking vessel	42
Bowl	104
Jug	36
Jar	5
Flask	4
Other closed vessel	9
Unguent bottle	6
Bottle	24

Table 4.5.9 Summary of vessel attributes (minimum numbers) from Xanten

The range of colours in the Xanten assemblage compares closely with the groups from bands A-C, in particular the high percentage of polychrome vessels and the inclusion of opaque colours. Colourless glass barely features, though one of the colourless vessels, a beaker with complex decoration combining facet-cutting and mould-blown indents, is

particularly interesting. The decoration is unusual, though parallels are known from Britain and elsewhere, and its presence in a pre-Flavian context is important.

The number of bowls is enhanced by the very large quantity of non-blown ribbed bowls (Isings form 3) which form over 67% of the total number. There are 29 polychrome versions, only two fewer than the number of naturally coloured blue/green bowls, which would normally be expected to be found in much greater quantity. This near-parity between the two colour groups suggests strongly that not all the blue/green bowls were recorded, and indicates that the total number of non-ribbed bowls for the group was probably even greater. The proportion of non-blown vessels in general is very high, probably reflecting the fact that this group represents glass use from the Augustan period onwards. The inclusion of early types of polychrome non-blown vessels such as strip-mosaic bowls re-enforces this theory.

There are three mould-blown tablewares in the group (a fourth catalogued, a yellowish globular vessel with a lattice design is modern, probably a 19th-early 20th century fire-extinguisher ball). Of the Roman vessels, the first is the colourless indented beaker discussed above. There is also a dark green sports cup and a further vessel with vertical close-set ribs similar to those found on cups and bowls from Eysses, Usk and Valkenburg.

The blown drinking vessels are dominated by a single form, wheel-cut cups of Isings form 12. These occurred in cased glass, and with painted decoration, but most were blue/green. The only other firmly recognised form of drinking vessel was the tall wheel-cut beaker, one of which has a solid domed base. Two non-blown bowls, one dark blue and the other colourless, had handles and have been classed as scyphi. A further winged handle fragment from a blown vessel very probably comes from a further scyphus. Three other large individual serving vessels with handles were also noted and may come from canthari or modioli.

Jugs appear to be nearly as numerous as drinking vessels, though the identification in many cases was based upon small handle fragments and the total many not be accurate. It seems though that the dominant forms were conical or globular jugs with long necks and angular handles (such as Isings form 52 and 55). Bottles are not numerous but are almost certainly under-represented as body fragments were not catalogued. One of the

square bottles has been blown into a mould with a base mark engraved with circles containing the letters ‘HRESIM’, part of the phrase ‘Chresimus fecit’ also noted on the square bottle from Usk.

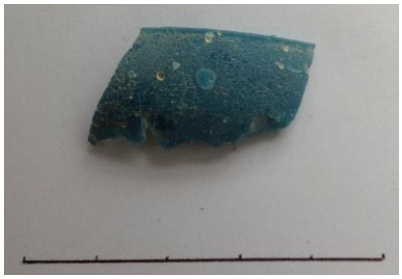
Fig.4.5 Vessels from Band D


a


b.

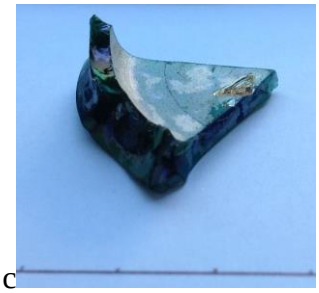

c

Fig.4.5.1 Non-blown polychrome vessels, Cremona


a


a


c


e


f

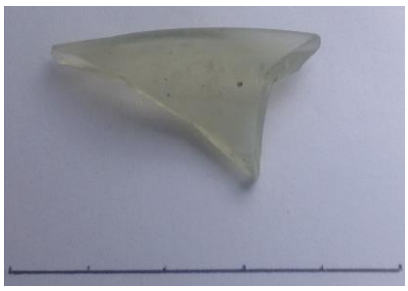
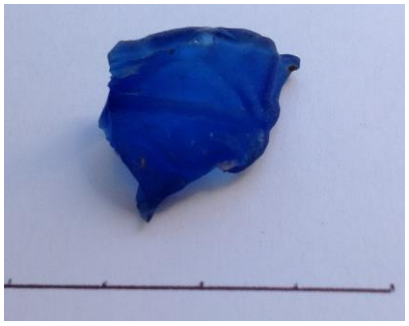

g

Fig.4.5.2 Non-blown monochrome vessels, Cremona


a


b


c

Fig.4.5.3 Mould-blown tablewares, Cremona

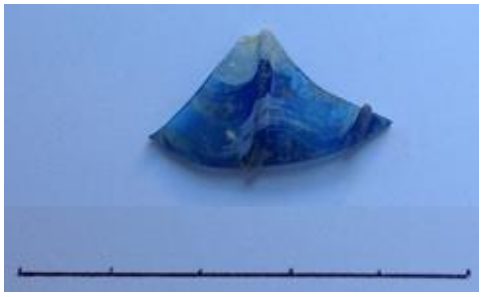
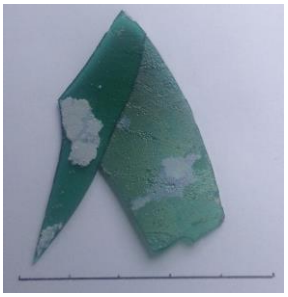
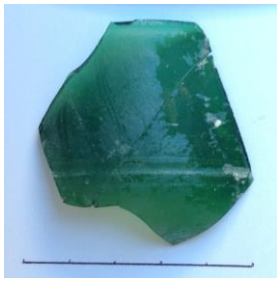
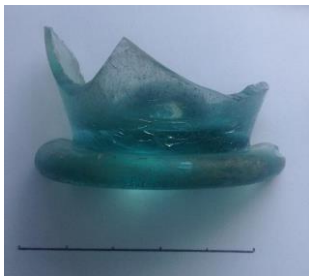
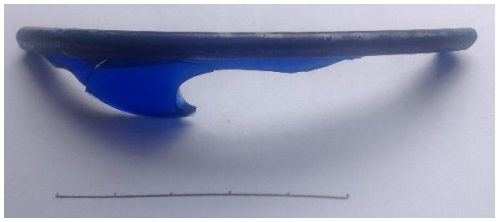

a

b

Fig.4.5.4 a. Polychrome ribbed blown bowl, b. possible painted cup, Cremona


a

b

c

Fig.4.5.5 Monochrome cups and beakers, Cremona



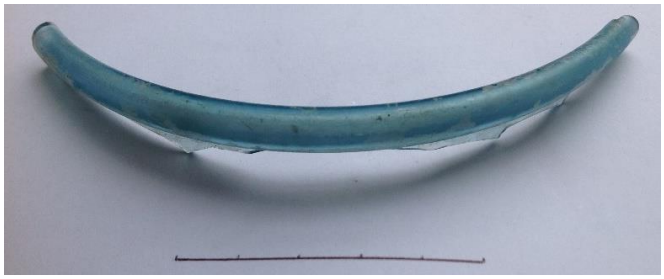
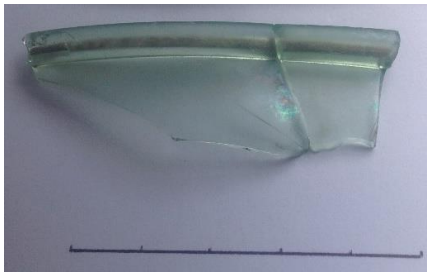



Fig.4.5.6 Monochrome blown bowls, Cremona


a

b

Fig.4.5.7 a. Jug/flask and b.jar, Cremona


a

b

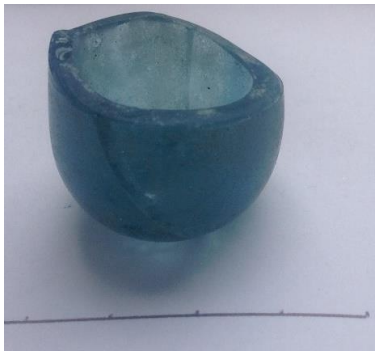

c

Fig.4.5.8 a. and b. Bottles and c. unguent bottle, Cremona

Eysses


a

b

c

Fig.4.5.9 Polychrome ribbed bowls, Eysses

Fig.4.5.10 Ribbed bowls, Eysses

Fig.4.5.11 Mould-blown cups, Eysses

a

b

Fig.4.5.12 Mould-blown beakers a. with mythical figures b. with 'almond' bosses, Eysses

a

b

c

Fig.4.5.13 Mould-blown vessels, Eysses

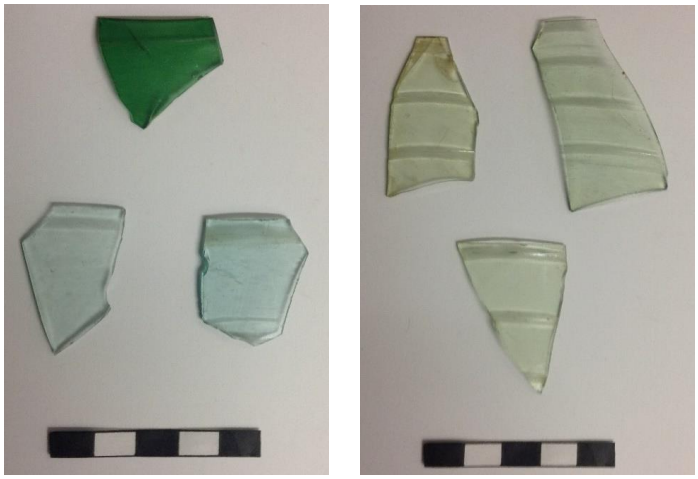


Fig.4.5.14 Wheel-cut cups, Eysses

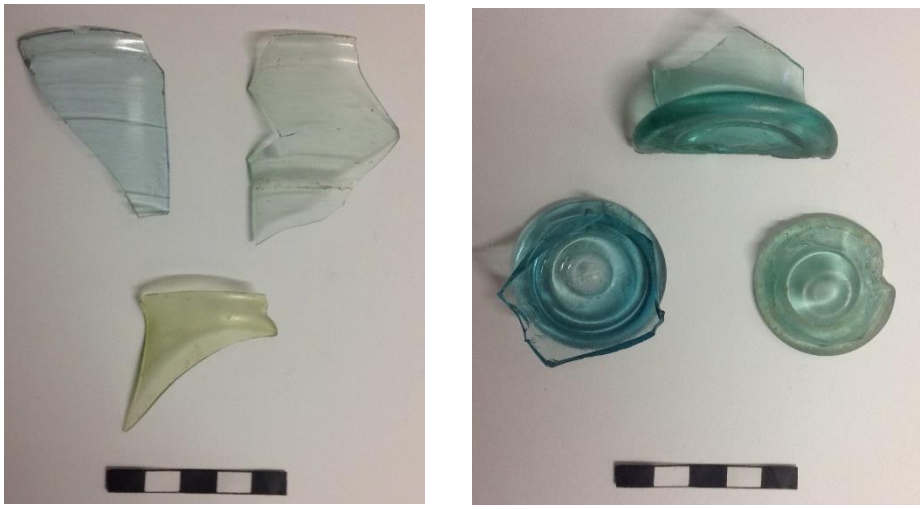
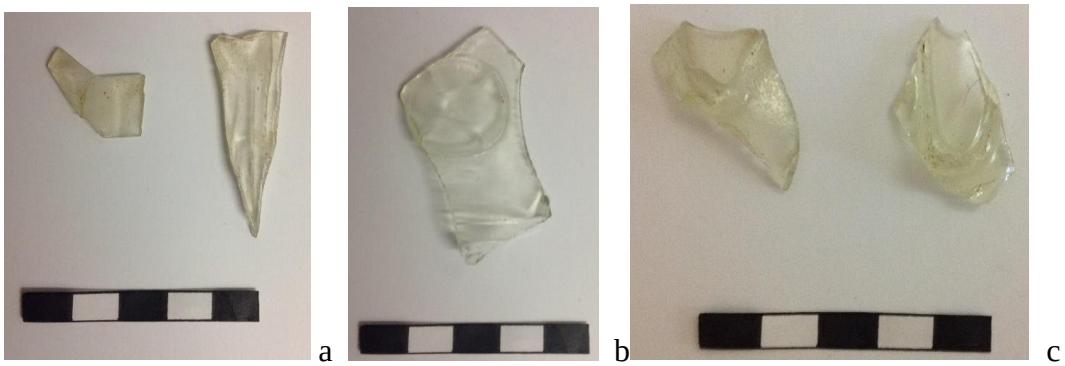


Fig.4.5.15 Wheel-cut beakers, Eysses



a b c

Fig.4.5.16 Colourless vessels, Eysses


Fig. 4.5.17 a. Trailed and b. indented vessels, Eysses


a

b

Fig.4.5.18 a. Tubular and b. concave bases, Eysses

Fig.4.5.19 Bowls with handles,Eysses

Fig.4.5.20 Tubular rimmed bowl, Eysses

Plantation Place, London

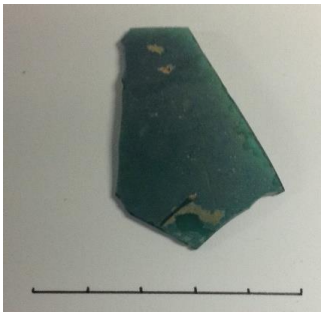



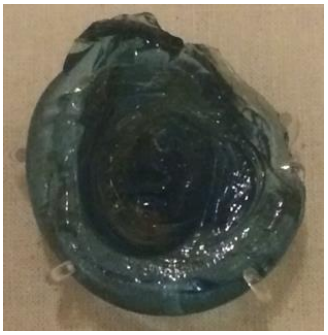
Fig.4.5.21 Polychrome non-blown ribbed bowl Fig.4.5.22 Non-blown convex bowl

Usk

a

b

c



d

e

f

g

h

i

Fig.4.5.23 a. and b. non-blown ribbed bowls, c. blown beaker, d. medallion from conical jug, e. mould-blown bowl, f. globular jug, g. square bottle h. ovoid flask, i. flask/unguent bottle (e. © Amgueddfa Cymru – National Museum Wales)

4.5.3 Review of the Glass from Band D

All sites, including those which incorporate earlier phases (Moers-Asberg, Nijmegen, Valkenburg and Xanten), have been included in the review, though these four sites have been excluded from the calculations relating to manufacturing method and decoration. The two London sites, which are statistically small groups, have been combined. Whilst many of the trends seen in the earlier bands show a continuation into band D, there are also features, particularly in colour and decoration, that appear for the first time, or show a shifting pattern.

A. Manufacture

There is a distinct reduction in the proportion of non-blown vessels from bands A-C and only at Usk does it exceed 20%. This may reflect the fact that much of the Usk glass came from pits deposits that might have included earlier rubbish material, whereas a high percentage of the Cremona glass is likely to have been in use at the moment the site was destroyed. This does not explain the low levels of non-blown glass from Eysses however, which was also recovered from a dump of material. The numbers of mould-blown tablewares show a slight increase, but remain very low, even at Eysses where despite the wide range of mould-blown forms, the proportion is still only 5%.

Site	Non-blown vessels	Mould-blown vessels	Blown vessels
Cremona (427)	12%	1%	87%
Eysses (472)	4%	5%	91%
London (83)	14.5%	2.9%	82.6%
Usk (164)	23%	2%	75%

Table 4.5.10 Manufacturing methods for tablewares for sites in Band D as a proportion of tableware assemblage, using minimum vessel numbers (in brackets)

B. Colour and Decoration

As would be expected, blue/green vessels far outnumbered other colours, but the range of other colours documented during this period is nevertheless extensive and comparable with what was seen in the earlier bands A-C. The inclusion of the four sites with earlier

occupation has little effect on the total number of different colours noted, as only at Xanten, where a 'black' glass vessel was noted, did the range of colours exceed those seen at Cremona and Eysses.

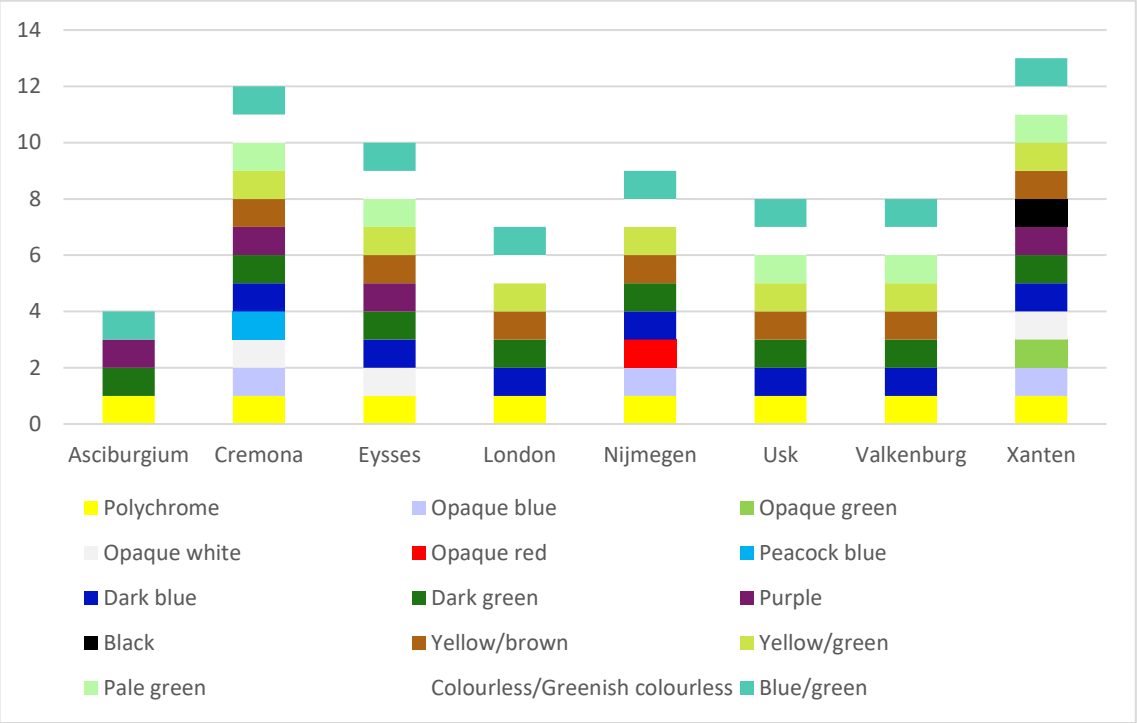


Fig.4.5.24 Colour occurrence in Band D

Colourless vessels are rare on all sites, but a major difference between band D and earlier bands is the regular occurrence of truly water-clear colourless glass, seen on a new range of vessel forms, facet and relief-cut beakers and indented and trailed beakers.

	Reticelli	Strip mosaic	Cane sections	'Marbled'
Cremona	0	0	3	1
Eysses	0	0	3	1
London	0	0	2	0
Usk	0	0	3	0

Table 4.5.11 Types of polychrome in non-blown vessels in Band D

Non-blown polychrome vessels are clearly more rare than in earlier bands, and despite the greater size of the groups from Cremona, Eysses and Usk, the number of recorded items is considerably lower. *Reticelli* and strip mosaic vessels are absent from the groups in band D where material from earlier phases was less likely to feature.

	Blobs	Cased	Painted	Fold	Indent	Trail	Rib	Facet/ relief	Wheel-cutting
Cremona	0	0	?1	2	2	1	1	0	30
Eysses	0	0	0	0	5	12	1	4	25
London	0	0	0	1	0	0	0	0	3
Usk	2	2	0	0	3	0	10	1	25

Table 4.5.12 Decoration of blown vessels in Band D

The most notable change in the range of decorative techniques used on blown vessels in this band is the appearance of beakers with facet or relief cutting. These vessels, highly visible from even small fragments, occur only in small numbers, but their introduction marks a significant development both in the emergence of the use of colourless glass and the complex cutting methods.

C. Vessel Form

Division into general form categories is presented for the four fully quantified sites in this band (Fig.4.5.25) and there is a marked variety in the proportions in each group.

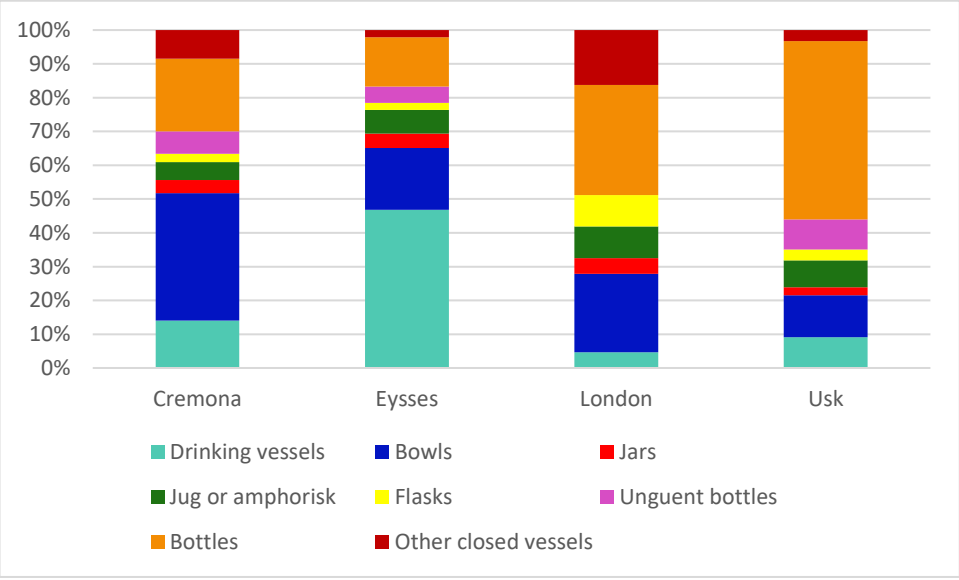


Fig.4.5.25 General vessel forms in Band D (as % of total recognised forms)

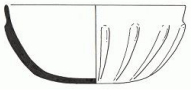
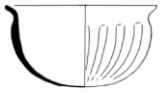
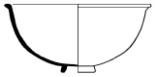
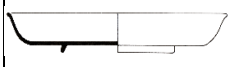
The proportion of drinking vessels at Eysses is particularly high, whilst at Cremona bowls are the dominant form. Jugs appear to be slightly less common than in previous bands.

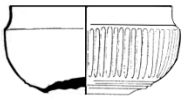
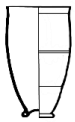
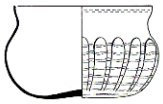
Jars however are present at all sites, though never forming more than 5% of the recognised vessels. Bottles show an increase across all sites from previous bands and account for over 50% of the recognised vessels in the Usk assemblage. Bottle use is also high at the two London sites, which notably include Plantation Place, the site of a post-Boudican military garrison. The Cremona assemblage, thought to derive from a domestic townhouse is over 20% bottle glass, suggesting bottle use was not only on the increase at military sites.

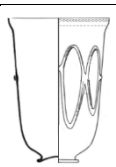
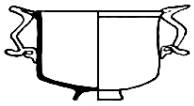
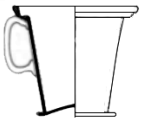
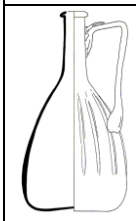
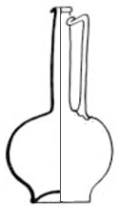
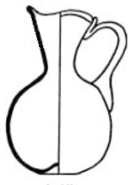
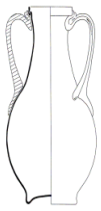
D. Specific Vessel Forms

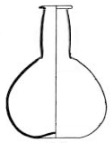
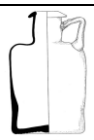
Many of the forms current in bands A-C are still common here, but there are several new types. The Eysses assemblage is notable not only for the number of drinking vessels, but also the variety of individual forms, many of which occur for the first time in this band. Amongst these are the mould-blown mythological beakers from Eysses, the facet and relief-cut colourless beakers from Eysses, Usk and Xanten and the trailed/arcaded beakers from Eysses and Usk. It is notable that these new drinking vessels are in the form of tall beakers rather than cups. The bowl forms are less diverse, with ribbed bowls and tubular rimmed bowls the two dominant types, as in previous bands. The non-blown range of forms has two new colourless additions, the scyphus and a single example of a wide-rimmed bowl from Cremona. Amongst the closed vessels there are no distinctive new forms. Jars, more common in this band than previously, are dominated by the collar rim form. Bottles occur at all sites with square bottles generally more common than cylindrical forms.

Table 4.5.13 Specific vessel forms from Band D

Form	Description	Moers-Asberg	Cremona	Eysses	London Plantation Pl	London Southwark St	Nijmegen Kops Plateau	Usk	Valkenburg	Xanten, Vetera I
Non-blown vessels										
	Carinated cup		?1				1			
	Carinated bowl		1				1			
	Cylindrical cup	1	1-2				1			1
	Ribbed bowl		24	17	2	3	43	35	21	70
	Ribbed bowl, out-turned rim		?1							
	Convex bowl	1	1		1				1	1
	Scyphus					1				2
	Convex bowl with base ring		?1							
	Shallow bowl with base ring							?1		?1
	Pyxis		1							
	Wide-rimmed bowl		1							
Mould-blown vessels										

	Sports cup			3-5				1		1
	Conical beaker with raised motifs		1	7-8				1		
	Ribbed bowl			4		1		1	1	1
Blown vessels										
	Wheel-cut cup	1	11	10		1	21	21	24-5	24
	Wheel-cut beaker with solid base	1	4	19			4	1	1	2
	Beaker on tubular base							1		
	Tubular rim bowl		36	7-9	1	1	2	1-3	?1	1
	Ribbed cup/bowl		1				1			2
	Beaker with external cut decoration			3				1		1
	Colourless wheel-cut cup				?1					
	Indented cup/beaker		?1	5-6				?3		

	Arcaded beaker			9				1		
	Cantharus	2							1	1
	Scyphus			1-2						1
	Modiolus								?1	
	Conical jug				1	1		7	2	
	Globular jug					1	4	1	1	
	Jug with spout							1		
	Amphorisk							?1	?1	
	Jar with collar rim	1	7	3	1		1	3	2	3

	Ovoid flask/unguent bottle						3			
	Bath flask			2		2		1		
	Piriform/globular unguent bottle						8	2		
	Tubular unguent bottle	1	5-7	5			1	18		5
	Conical unguent bottle		2-3	1			2			
Bottles										
	Cylindrical bottle		19-25	16	2	3	3	28	2	
	Prismatic bottle	1	36	4	4	16	8	180		7
	Hexagonal bottle					1				

4.6 Band E c.A.D.70-A.D.80

4.6.1 Introduction

This band is dominated by the large and well conserved assemblage from Pompeii. The glass from *Regio* I has been chosen for study as it has been the subject of a recent comprehensive catalogue (Scatozza Höricht 2012). This publication only includes glass from domestic and commercial contexts, and therefore is highly likely to represent the glass in use at the time of the eruption.

The highly specific dating from Pompeii is not paralleled at any other site in this study and the process of deposition is clearly very different. The three sites from London in this band are much more loosely dated. Here the dates rely on relative phasing, ceramics, coins and current interpretations of the development of Roman London. The foundation of Carlisle however is clearly marked by the date of the felling of trees used in the construction of the first fort to A.D.72/3. The group of glass here comes from the earliest phases of occupation at Carlisle, covering the first ten years of the fort's life. There is very little glass from the earliest dated contexts at Ribchester and the group has been included for the purpose of comparison.

4.6.2 Band E Site Analysis

Pompeii; London, Leadenhall Court Period 2; London, Paternoster Square Period 4; London, Plantation Place Period 303-304; Carlisle; Ribchester

Pompeii *Regio* I (figs.4.6.1-13)

This area lies in the south-east quadrant of the town. It has not been fully excavated, but the structures that have been exposed appear to represent a mix of dwellings, shops, workshops and eating places (Scatozza Höricht 2012; Fontaine 2009; Allison 2006; Beretta et Di Pasquale 2004). Nearly 950 glass vessels from *Regio* I have been included, making it one of the largest groups. Furthermore, the nature of survival means that most of the vessels can be fully identified, making this the assemblage that most accurately records the relative occurrence of different forms.

The passage of time and the multiplicity of teams and projects that have taken an interest in the remains from Pompeii have inevitably led to some confusion on provenance. For example, some vessels that are listed in one publication as being from *insula* 10 (Allison 2006) are listed as coming from buildings in *insula* 4 by Scatozza Höricht (2012). Given the size of the sample and the fact that whatever the exact provenance, the vessels all come from the same general find-spot and are contemporary, these discrepancies are regarded as very minor.

Whilst the glass from Pompeii seems to be one of the more straightforward assemblages to analyse, given its precise end date, there are nevertheless several caveats to consider. It is very possible that some vessels, particularly highly prized pieces, might have been taken away by the townspeople leaving with their possessions during the evacuation of the town when the eruption first began (as described by Pliny the Younger for inhabitants of Stabiae, *Plin. Ep.* 6.16). There is also the possibility that looting may have taken place in the general chaos of the eruption. Finally, it should be borne in mind that this group has come into the archaeological record in a unique manner, differing from all the other assemblages in this dated band in this respect. These are not discarded or broken vessels, and as such their lifetime has been curtailed, and this factor must influence comparisons in the dating of groups of glass in use in the A.D.70s.

Period	Date	Recorded items
Single phase	A.D.79	947
Production method (excluding bottles)		
Non-blown	31	
Mould-blown	18	
Blown	825	
Colour (excluding bottles)		
Polychrome	7	
Dark blue	16	
Dark green	34	
Purple	1	
Mid blue	1	
Opaque blue	1	

Opaque red	1	
'Black'	3	
Yellow/brown	12	
Yellow/green	3	
Pale green	64	
Blue/green	721	
Colourless	7 + 1 greenish colourless	
Decoration (blown vessels)		
Ribs	2	
Wheel-cut lines	26	
Trails	1	
Indents	10	
Blobs/splashes	3	
General vessel forms		
Drinking vessel	39	
Bowl	121	
Jug	29	
Jar	68	
Flask	11	
Unguent bottle	578	
Bottle	66	

Table 4.6.1 Summary of vessel attributes (minimum numbers) from Pompeii *Regio* I

The assemblage of glass from *Regio* I is dominated by unguentaria. They are found in nearly every structure, regardless of status or function, from *thermopolia* and *cauponae,* to workshops and domestic houses small or grand. The quantities in which they are found contrasts noticeably with all the other groups in this study. The survival of complete vessels is clearly a factor in the high number recorded, as small body fragments of flasks and unguent bottles can be difficult to identify. Nevertheless, these vessels outnumber other forms to a much greater degree than at other sites. Possible reasons for this discrepancy will be discussed in Chapter 5.3.6. In terms of glass colour and decoration, the flasks and unguentaria from Pompeii are generally unremarkable. They are predominantly made in monochrome blue/green glass, and whilst a few are mould-blown,

nearly all are free blown. Occasionally they have horizontal wheel-cut decoration, but the overwhelming majority are undecorated. They come in a variety of sizes, which may reflect on the nature of the product they contained. Most examples have an ovoid or slightly convex body (comparable with Isings forms 6, 26 and 28a; Fig.4.6.1). The next largest group consists of unguentaria with a tubular body, equivalent to Isings forms 8 and 27 (Fig.4.6.2.a and b). Other types, very much less common, include spherical, bird-shaped and amphora-shaped unguentaria (Fig.4.6.2.c) (Isings form 10, 11). Of the mould-blown forms, four are in the form of dates or pine/cedar cones and the fifth is ribbed. Alongside the unguentaria are five small jars (Isings form 68) (Fig.4.6.2.d) that may have contained a similar range of products, such as cosmetics and ointments and four spherical bathflasks (Isings form 61).

Non-blown vessels form just over 10% of the tableware assemblage, but in contrast to other sites, this category is not dominated by ribbed bowls (Isings form 3) of which there are only five examples, all blue/green. There is also very little non-blown polychrome glass, just two *pixides* (Fig.4.6.3.a), formed from strips of multi-coloured glass, one having elements of gold leaf enclosed in colourless glass. Amongst the other monochrome wares, carinated cups (Isings form 2) are nearly as numerous as the ribbed bowls, and there is also a shallow bowl with a carinated profile. Two large vessels with deep convex bodies are described as non-blown *cratere* and were likened by Scatozza Höricht to Isings form 36, though this is usually a blown type. There are three convex bowls on low base rings, one opaque red (Fig.4.6.3.b), one dark green and another with a highly unusual horizontal rim that has been ground around the edge to form ten points separated by arcs (Fig.4.6.4). More conventional non-blown forms include two cylindrical bowls of Isings form 22, a similar shallow bowl with slightly conical sides, and two small conical bowls all dark green. Two non-blown items are made from glass that appears black, one is a hemispherical bowl and the other a tray with carved handles. There is a further incomplete tray in dark blue glass. Three non-blown vessels are colourless. The first is one of the carinated cups of Isings form 2, which is very unusual in colourless glass. Two colourless bowls have carved handles and cylindrical bodies and can be identified as *scyphi*.

Mould-blown tablewares also form only a small proportion of the total assemblage. More than half are drinking vessels, with conical beakers of Isings form 31 the most common

single type. These are decorated with common motifs, including circular and tear-shaped bosses and vegetal scrolls. One cup has part of a Greek inscription, with the word ΕΥΦΡ(Ο)ΣΥΝΗ (happiness). One of the beakers is colourless and has pronounced mould-blown indents bordered with raised cordons, reminiscent of vessels from Eysses and Xanten in band D. The other mould-blown tablewares are three decorated bottles, one with indents, one with a variety of vegetal and geometric motifs (Fig.4.6.5) and the third with comma-shaped motifs, a jug with ribbed decoration and an amphorisk with vertical ribs on the lower body.

The vast majority of tablewares from Pompeii are blown and most are simple undecorated vessels made in uncoloured blue/green glass. Bowls are very much more common than cups or beakers. The most frequently noted forms are bowls with tubular rims (Isings form 44; Fig.4.6.6) and bowls with out-turned rounded rims, convex sides and tubular base rings (Isings form 42; Fig.4.6.7). This latter is the first type with a fire-rounded rim to feature in significant numbers. Both bowl forms occur in a range of sizes, but the tubular/out-turned form of the rim would suggest they were bowls rather than drinking vessels. This means that drinking vessels in glass are rather uncommon. Convex wheel-cut cups (Isings form 12) are present, but in very small numbers. There seems to be a little more emphasis on taller drinking vessels, with conical and cylindrical beakers the more common in a generally poorly represented group. There are several examples of the large vessels for serving/display such as canthari and modioli (Fig.4.6.8). Whether these vessels had a specific function is unclear, though wall-paintings from the Vesuvian region do indicate that the display and presentation of fruit was at least one role played by scyphi and canthari (see for example paintings from the House of Julia Felix in *Regio* II and the Villa Poppaea at Oplontis). There is also a single example of a rhyton, a horn-shaped drinking vessel with an out-turned fire rounded rim (Fig.4.6.9).

Jugs from Pompeii tend to be wide-necked (Fig.4.6.10 a), and the dominant forms are biconical or ovoid jugs with rolled-in rims and globular jugs with no neck but a constriction below the rim. Both types are occasionally decorated with a horizontal pinched trail around the rim edge on either side of the upper handle attachment. Conical and globular forms with long cylindrical necks (e.g. Isings forms 52 and 55) are not present though there is a conical jug with a shorter neck, tubular base and an angular

handle with a pinched extension trail (Fig.4.6.10.b). Only one amphorisk, a polychrome vessel with opaque white splashes was noted in *Regio* I (Fig.4.6.11.c)

Jars are more common at Pompeii than at all other sites in this study. This may well be a result of increased recognition of the form, which is difficult to identify unless part of the rim is preserved. Most are undecorated, with an ovoid body and either a horizontal folded rim or a rolled-in or fire rounded rim edge (Fig.4.6.11). The number of square-bodied jars is remarkable when compared to the rarity of this form at other sites (Fig.4.6.12). The bodies of these vessels are identical to those of square bottles up to the shoulder, and the disparity in the numbers recognised across sites may be a result of an assumption elsewhere that flat body and base fragments are from bottles.

Bottles themselves occur in the same numbers as jars (Fig.4.6.13). Square bottles out-number cylindrical bottles by over 3.5:1 and are the only type of prismatic bottle from *Regio* I – there are no examples of hexagonal bottles. More than half of the square bottles are described as free blown and have no base mark, suggesting that they were not produced in moulds. This is not a feature noted on square bottles at other sites in this study. It may be that these are regionally produced, or that similarly made square bottles have not been recognised from smaller fragments at other sites.

In summary, the assemblage from Pompeii *Regio* I gives a clear picture of the highly utilitarian role of the majority of glass vessels. Unguentaria and other flasks are by far the most common types, and bottles and plain jars feature very strongly. Tablewares are rarer, and decorated vessels even more so. The decorated mould-blown items would have been unusual items as would the strongly coloured cups and bowls, the polychrome vessels and the decorated jugs and jars.

London, Leadenhall Court

Excavations from 1984-6 explored an area totalling about 30m² at the northern end of the structure identified as the 2nd century A.D. basilica (Milne and Wardle 1993). The earliest buildings at the site (period 2, c.A.D.65-70/5) were interpreted as farming-related, in a location away from the main focus of development of the Roman city. The buildings of

period 2 are set back from the main road leading north from early Roman London. A contemporary well or pit (N15) produced at least 46 fragments of glass vessels.

Period	Date	Recorded items
2	c.A.D.65-70/5	65
Production method (excluding bottles)		
Non-blown	8	
Blown	29	
Colour (excluding bottles)		
Polychrome	1	
Dark blue	1	
Blue	1	
Colourless	1	
Blue/green	21	
Decoration (blown vessels)		
Ribs	1	
Facets	1	
General vessel forms		
Drinking vessel	1	
Bowl	8	
Jug	2	
Jar	1	
Flask	1-2	
Bottle	28	

Table 4.6.2 Summary of vessel attributes (minimum numbers) from Leadenhall Court period 2

This group contains predominantly blue/green vessels, with no other colour represented by more than one vessel. Bowls were the single most common tableware form. All were non-blown, and all but one were ribbed bowls of Isings form 3. The other, also the only polychrome vessel, was a convex bowl in dark green glass with opaque yellow spirals. The only drinking vessel noted was a good quality colourless beaker with ‘jigsaw’ facets. Two jugs were identified, one of which had a pouring spout. This group has a high

percentage of bottle glass fragments (28), and though only four individual vessels were catalogued, the actual number of bottles is likely to be much higher.

London, Paternoster Square Sites, Period 4

The three sites published together in the Paternoster Square area near St Paul's Cathedral (Watson and Heard 2006) revealed a layer of burning associated with the Boudican revolt of A.D.60/1. Immediately after the fire there seems to have been a period when the site was unoccupied, perhaps for as long as ten years. From around A.D.70 renewed activity saw the resurfacing of the main road west and the construction of timber and clay buildings along its south side. Further buildings line a secondary north-south road. The excavators speculated on a possible military presence, perhaps associated with post-Boudican reconstruction (Watson and Heard 2006, 33-4). Period 4 spans from the early Flavian period to end of the 1st century, and whilst this is a wide dated band, the absence of activity in the immediately preceding period may help define it a little more closely.

Period	Date	Recorded items
4	c.A.D.70-100	63
Production method (excluding bottles)		
Non-blown	2	
Blown	34	
Colour (excluding bottles)		
Dark blue	2	
Dark green	1	
Yellow/brown	3	
Yellow/green	3	
Blue/green	25	
Greenish colourless	2	
Decoration (blown vessels)		
Ribs	2	
Wheel-cut lines	1	
Indents	1	
General vessel forms		

Drinking vessel	2
Bowl	2-3
Jug	2
Jar	1-2
Jug/jar	2
Jug/flask/bottle	3
Unguent bottle	1
Bottle	25-7

Table 4.6.3 Summary of vessel attributes (minimum numbers) from London, Paternoster Square period 4

The glass assemblage is much the same size as that from Leadenhall Court, but produced just two non-blown vessels, both ribbed bowls (Isings form 3). There was one blown bowl in very dark yellow/brown glass, with an applied base of a type often found on tubular rimmed bowls (Isings form 44). Two blown drinking vessels were present, one a dark green wheel-cut cup of Isings form 12, the other a blue/green indented cup or beaker. There were many more examples of closed vessels, including a jar with collar rim, at least two jugs, a tubular unguent bottle and several bottles, some very large. Strongly coloured tablewares form about a quarter of the total number. There are two greenish-colourless vessels, both represented by undiagnostic body fragments.

London, Plantation Place Period 3 phases 3-4 (figs.4.6.14-16)

Period 303 at the Plantation Place fort shows continuing occupation, along with signs that some areas were being abandoned and dismantled (Wallace 2013, 285; Dunwoodie, Haward and Pitt, 2015). Latrines were infilled, parts of the circuit ditch silted up, the granary and other buildings were demolished and there is a general impression that day to day activity at the fort had declined. In period 304 the defences were infilled and levelled. The glass from both these periods is included here.

Period	Date	Recorded items
Period 303 and 304	c.A.D.70-c.A.D.85	125
Production method (excluding bottles)		

Non-blown	9
Mould-blown	3
Blown	83
Colour (excluding bottles)	
Dark blue	9
Dark green	4
Mid green	1
Yellow/green	2
Pale green	2
Blue/green	75
Colourless	4
Decoration (blown vessels)	
Ribs	4
Wheel-cut lines	5
Facets	2
Trails	1
General vessel forms	
Drinking vessel	10-12
Bowl	10-11
Jug	4
Jug/jar	2
Jar	2
Jug/flask	2
Flask	1-4
Unguent bottle	4
Bottle	26

Table 4.6.4 Summary of vessel attributes (minimum numbers) from London Plantation Place periods 303-304

These two periods are notable for the lack of polychrome glass and the high number of drinking vessels and bowls. The non-blown fragments nearly all come from blue/green ribbed bowls (Isings form 3). A thick-walled fragment comes from a non-blown pale green vessel which is difficult to identify precisely, but appears to be a shallow bowl or

plate with a very wide diameter (Fig.4.6.14). There is a mould-blown bowl with a number of interesting features (Fig.4.6.15.b). The fragment probably comes from the lower body of a wide vessel with a straight side tapering in towards the base. It is decorated with vertical gadroons with rounded edges, below a horizontal cordon. It is rather thick-walled for a mould-blown vessel, and it also of an unusual greyish-colourless appearance with a streak of pale purple. This suggests the presence of manganese, though whether as a de-colourant or because the vessel was intended to be purple is unclear. A further mould-blown vessel is a beaker decorated with raised bosses in the shape of lotus buds, above a winding vegetal scroll (Fig.4.6.15.a). There are two good-quality colourless beakers with exterior cutting, one with meandering jigsaw facets (Fig.4.6.14.a) and the other with raised oval motifs (Fig.4.6.14.b). A further colourless beaker has trailed loops (Fig.4.6.14.c). The remaining drinking vessels are mostly convex cups of Isings form 12, though there is one tall wheel-cut beaker. There are relatively few jugs recognised at the site. One is a conical jug and another of unidentified form has diagonal ribbed decoration. Two tubular rim fragments probably come from jars and there were four unguent bottles, two of which were tubular. Prismatic bottle fragments were about twice as numerous as the cylindrical versions.

Carlisle (Fig.4.6.17)

A series of excavations dating from the 1950s have uncovered parts of the fort and surrounding settlement (McCarthy 1990, 1991, 2000; Caruana 1992; Zant 2009). The preservation of a considerable quantity of waterlogged timber has allowed activity during the late 1st century to be closely dated. Episodes of refurbishment and reconstruction of the fort occurred at roughly ten-year intervals until the early 2nd century A.D.

The most closely dated glass assemblages come from the sites at Annetwell Street (unpublished), Fort Annexe Ditch (Cool 1992) and the Millennium/Castle Green site (Howard Davies 2009). Fragments from period 2 (construction of the fort in A.D.72/3) and 3a (construction and occupation of the fort, c.A.D.73-c.A.D.83/4) are included here. Glass from the Fort Annexe Ditch is thought to date to the later A.D.70s/early A.D.80s and likely to be recently broken at the time the ditch was filled, because of the number of vessels represented by more than one fragment.

Period	Date	Recorded items
2	A.D.72/3	5
3a	c.A.D.73-c.A.D.83/4	64
3a (Annexe ditch)	Late A.D.70s-early A.D.80s	175
Total		244
Period 2-3a		
Production method (excluding bottles)		
Non-blown	11	
Mould-blown	2	
Blown	207	
Colour (excluding bottles)		
Polychrome	1	
Dark blue	3	
Mid blue	1	
Yellow/brown	2	
Yellow/green	1	
Pale green	8	
Blue/green	155	
Colourless	2	
Decoration (blown vessels)		
Splashes	1	
Ribs	5	
Wheel-cut lines	3	
Indents	1	
General vessel forms		
Drinking vessel	4-5	
Bowl	6	
Jug	4-5	
Jug/flask	1	
Jug/Jar	1	
Jar	1	
Unguent bottle	2	

Bottle	47

Table 4.6.5 Summary of vessel attributes (minimum numbers) from Carlisle

All the non-blown vessels from period 2-3a are ribbed bowls (Isings form 3) (Fig.4.6.17.a) and all are blue/green except for one, or possibly two yellow/brown bowls. There are two mould-blown drinking vessels. One, a small greenish colourless fragment comes from a straight sided vessel, probably a conical beaker (Fig.4.6.17.b). The other fragment comes from the base of an unidentified vessel, probably another beaker or cup.

Amongst the blown vessels there are another two, possibly three further drinking vessels, including an indented beaker and a beaker with horizontal wheel-cut lines. The best-preserved vessel is a polychrome globular jug with ribs on the body, from the Fort Annexe Ditch (Fig.4.6.17.c). This level of decoration, with opaque white splashes on a dark blue ground and vertical tooled ribs is unusual. This vessel was interpreted as probably being a recent breakage and occurring in a context rather late for a polychrome vessel. Consequently, it was described as perhaps having 'never been used but just left in store' (Cool 1992, 65). Two other strongly coloured vessels came from the Fort Annexe Ditch, a dark blue jar and a yellow/brown ribbed vessel, perhaps another jug. A further ribbed jug, perhaps globular also came from that assemblage. The two colourless vessels could not be identified. Containers were well represented. There were two unguent bottles and with 47 fragments of bottles, with prismatic bottles much more numerous that cylindrical forms.

Ribchester

The fort, constructed in c.A.D.72-5, is thought to have fallen into decline rather rapidly after its foundation. It was renewed with a different layout at the beginning of phase 2, probably in the late A.D.70s. Phase 1 therefore covers a period of less than ten years.

Period	Date	Recorded items
Phase 1	c.A.D.73/5-c.A.D.79	14
Production method (excluding bottles)		
Non-blown	1	

Blown	1
Colour (excluding bottles)	
Polychrome	1
Blue/green	1
Decoration (blown vessels)	
Ribs	1
General vessel forms	
Bowl	1
Jug	1
Bottle	12

Table 4.6.6 Summary of vessel attributes (minimum numbers) from Ribchester

This is too small a group to be statistically relevant, but it does indicate that a polychrome ribbed bowl (Isings form 3) in dark blue, opaque white and yellow was still in circulation at this point. The only other diagnostic tableware fragment was from a blue/green ribbed jug. Of the bottles, nearly two thirds were cylindrical, the remainder square or undiagnostic.

Fig.4.6 Vessels from Band E

Pompeii B/W photographs © P.Allison via The Stoa Consortium www.stoa.org. Colour © Museo Galileo Firenze (Not available for copyright reasons online; can be viewed at https://brunelleschi.imss.fi.it/vitrum

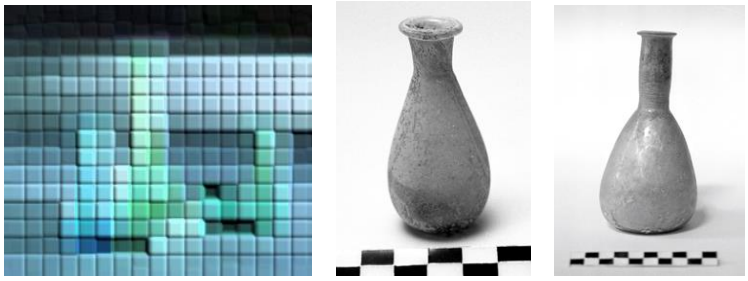
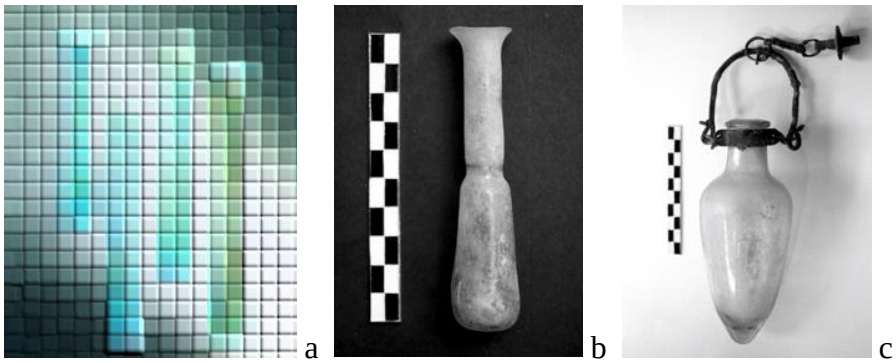


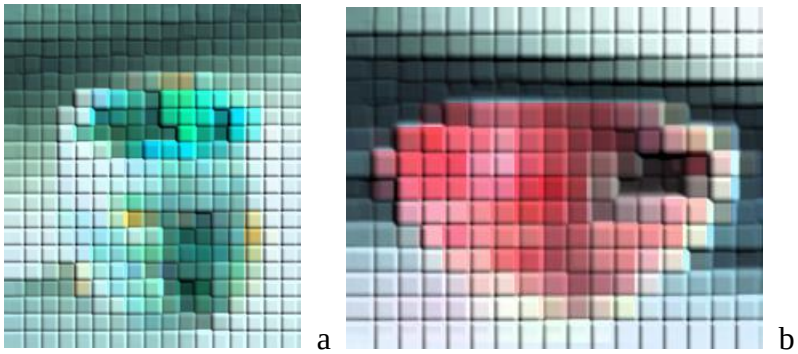
Fig.4.6.1 Unguentaria with convex and ovoid bodies, Pompeii



a b c

d

Fig.4.6.2 a and b. tubular unguent bottles c. amphora-shaped unguent bottle d. small ointment jar, Pompeii



a b

Fig.4.6.3.a Pyxis and b.non-blown bowl, Pompeii

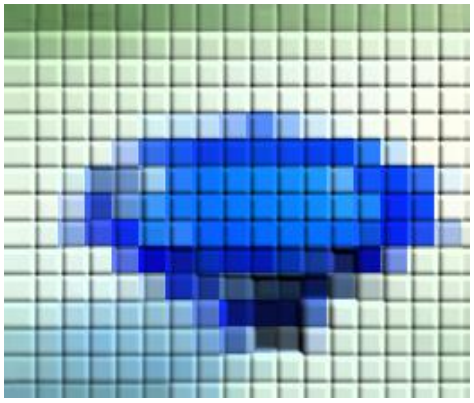


Fig.4.6.4 Bowl with scalloped edge, Pompeii

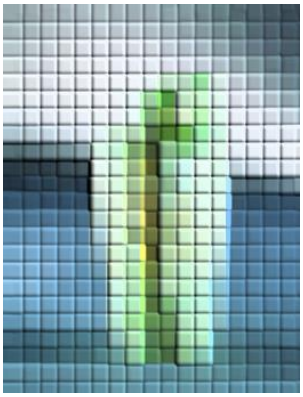


Fig.4.6.5 Mould-blown bottle, Pompeii

Fig.4.6.6 Tubular rimmed bowls, Pompeii

Fig.4.6.7 Bowls with fire-rounded rims, Pompeii

Fig.4.6.8 Modiolus, Pompeii

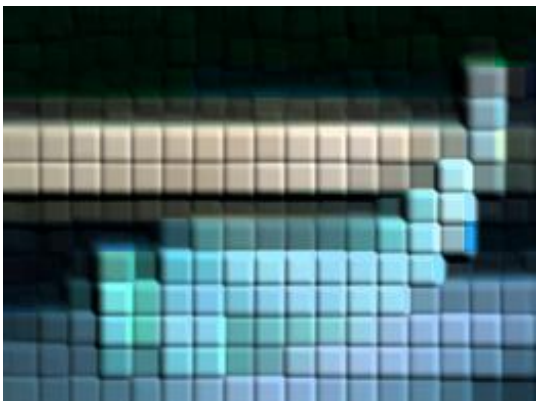
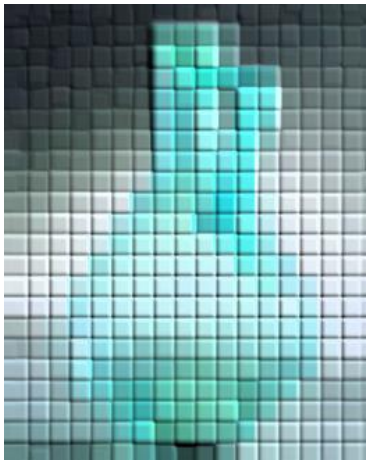


Fig.4.6.9 Rhyton, Pompeii


a

b

c

Fig.4.6.10.a and b Jugs and c. amphorisk, Pompeii

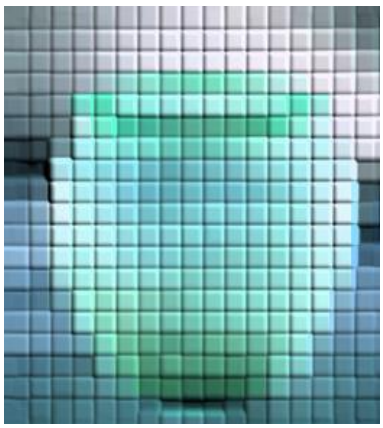


Fig.4.6.11 Ovoid jars, Pompeii


Fig.4.6.12 Square jars and bottles, Pompeii

Fig.4.6.13 Cylindrical and square bottles, Pompeii

Pompeii colour photographs © l'Istituto e Museo di Storia della Scienza 2006; black and white photographs © Joyce Agee and Penelope Allison 2008

Plantation Place, London

Fig.4.6.14 Non-blown plate, London

a

b

Fig.4.6.15 Mould-blown vessels, Plantation Place,

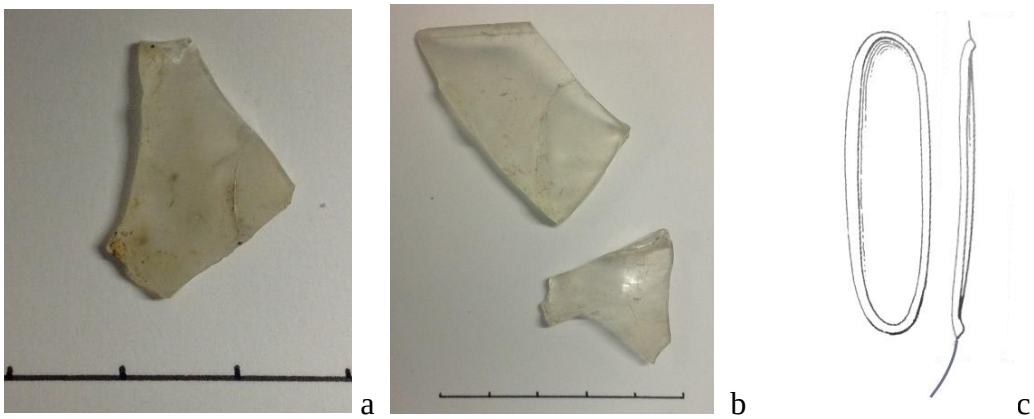


Fig.4.6.16 Beakers from Plantation Place, a. Facet-cut beaker, b. Relief-cut beaker, c.Arcaded beaker (adapted from Dunwoodie, Harward and Pitt, 2015 Fig.103)

Carlisle

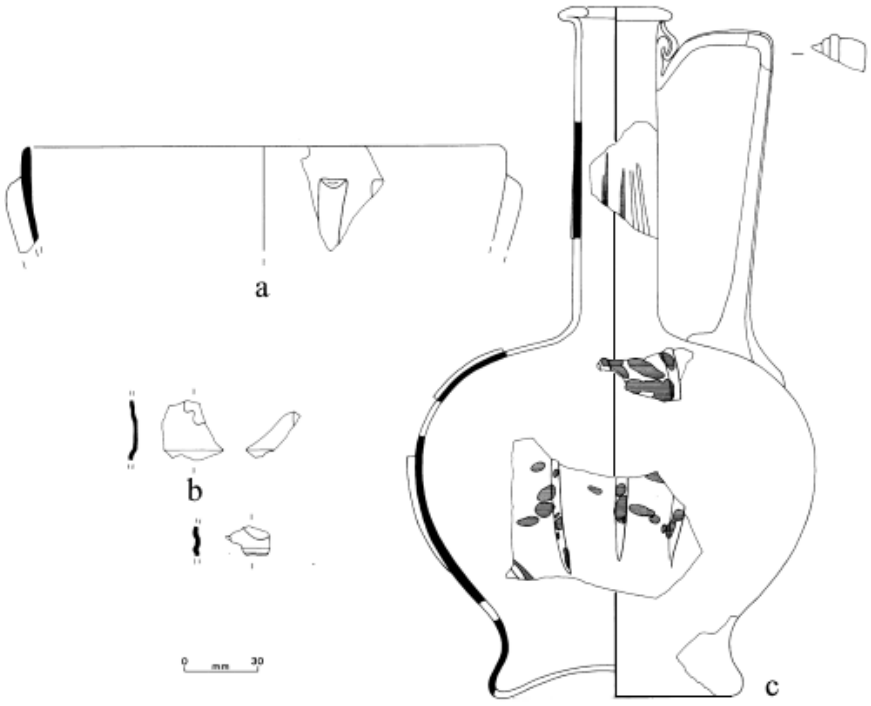


Fig.4.6.17 Glass from the Fort Annexe Ditch site, Carlisle (Illustrations reproduced from Cool 1992)

4.6.3 Review of the Glass from Band E

A. Manufacture

All three types of vessel manufacture were used to produce the tablewares in band E. Unguent bottles have been removed from the calculation, as they are considered here to be storage vessels rather than tablewares and given the numbers present at Pompeii, their inclusion would distort the proportion of blown vessels in relation to vessels produced by other techniques.

Site	Non-blown	Mould-blown	Blown
Pompeii (303)	10.2%	5.9%	83.9%
London Leadenhall Ct (37)	21%	-	79%
London Paternoster Sq (37)	5.5%	-	94.5%
London Plantation Pl (95)	8.4%	4.2%	87.4%
Carlisle (195)	5%	0.9%	94%

Table 4.6.7 Manufacturing methods in band E (as a proportion of tableware assemblage, using minimum vessel numbers (in brackets) and minus unguentaria

There is considerable variation in the three categories across the sites. Mould-blown glass is absent from two of the London sites, and barely present at Carlisle, but features much more strongly at Pompeii. With regard to Carlisle it is worth noting that a small number of mould-blown vessels are present in later contexts and that some of these may be residually deposited from the early years of the fort – one example being a dark blue sports cup from a phase 3b context. There are also mould-blown beakers from later contexts at Paternoster Square. The non-blown glass from Pompeii shows much more variety than the other sites, where non-blown vessels are almost all ribbed bowls. At Pompeii it seems that non-blown forms present in earlier bands, such as carinated cups (Isings form 2) and cylindrical bowls (Isings form 22) were still in use in A.D.79. The group from Leadenhall Court has twice the proportion of non-blown vessels of any of the sites, though there is no obvious explanation for this.

B. Colour and Decoration

There was very little polychrome non-blown glass at any of the sites. This was particularly striking at Pompeii where there were just two non-blown polychrome items, both small cylindrical *pyxides* in strip-mosaic glass and five further blown polychrome vessels, all of which were closed serving vessels with the exception of one dark blue and opaque white bowl. The two non-blown vessels made most frequently in polychrome glass, ribbed bowls (Isings form 3) and convex bowls (Isings form 1/18) are not present in *Regio* I and barely occur on the other sites in this band, with just one convex bowl in dark green and opaque yellow glass coming from Leadenhall Court and a tiny fragment of a polychrome ribbed bowl noted in the earliest contexts at Ribchester. Polychrome glass is completely absent at two of the London sites.

Purple is again very rare, with just one purple vessel recorded from Pompeii. Dark green vessels are more than twice as numerous as dark blue vessels at Pompeii, but this is reversed at the other sites (though the sample numbers are very small). Yellow/brown and yellow/green vessels are also generally less common than dark blue vessels. Pompeii is the only site to produce vessels in opaque colours, or in very dark 'black' glass, although as they only occur in very small numbers this may simply reflect relative sample size. Colourless glass was present at all sites, but in very small quantities. The fact that the large Pompeii group only produced seven truly colourless vessels is an important marker in the study of this type of glass and the continuing rarity of colourless glass in general will be discussed further in Chapter 6.2.6

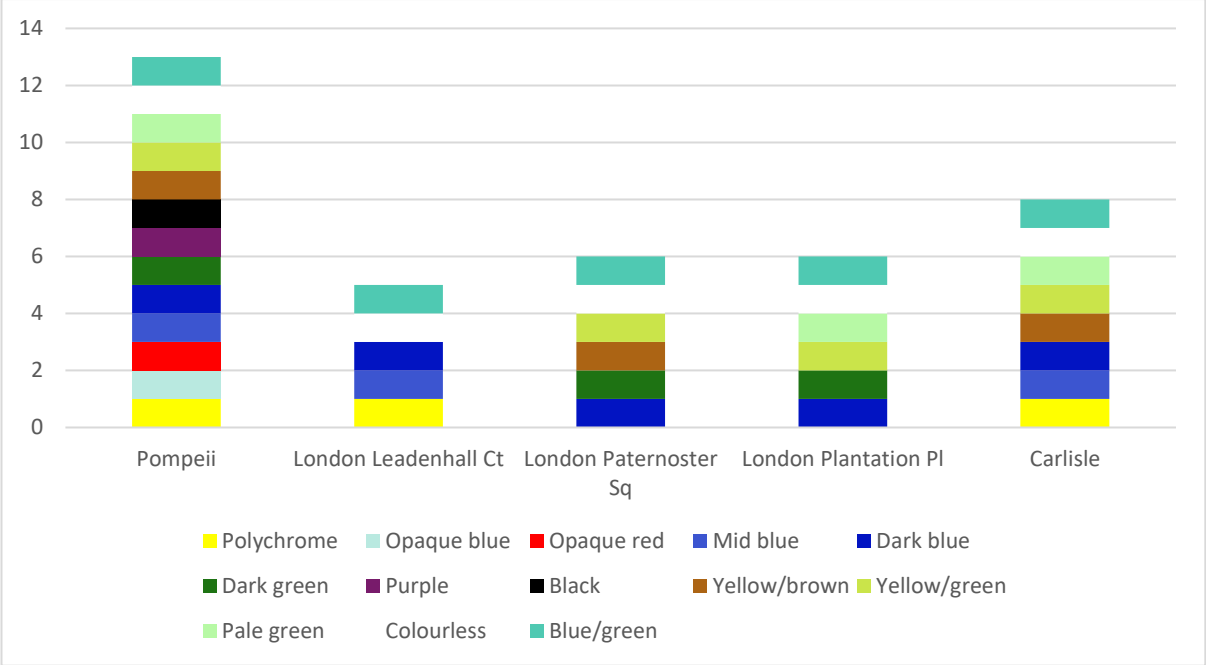


Fig.4.6.18 Colours present at sites in Band E

Only Pompeii and Carlisle produced blown vessels with polychrome decoration (fig 4.6.18). A globular jug from Carlisle and a jug and amphorisk at Pompeii had marvered opaque white splashes. A very unusual form of unguent bottle with three pinched feet in the Pompeii assemblage was decorated with unmarvered blobs in three contrasting colours and a blue bowl from Pompeii had an opaque white winding trail on the body. The only other fragment with trails in this group was in colourless glass from Plantation Place. Cased and painted vessels were absent.

	Blobs/ splashes	Indents	Trails	Ribs	Facet/relief-cutting	Wheel-cutting
Pompeii	3	10	1	2		26
London		1	1	3	1	1
Carlisle	1	1		5		3
Ribchester				1		

Table 4.6.8 Decoration of blown vessels in Band E

Vessels with vertical ribs were present at all the sites. Indents where present were always associated with beakers. Facet-cutting is present only once, and shows no increase on what was seen in Band D. Facet cut vessels are known from other areas of Pompeii, but

there are very few of them, the best known being the jigsaw-facet beaker in the National Archaeological Museum in Naples (Harden 1987, 192 no.102). Wheel-cutting was the most frequent type of decoration at Pompeii, but was still relatively rare given the size of the group.

C. Vessel Form

The proportion of vessels assigned to general vessel forms is shown in Fig. 4.6.19. Given the huge number of unguentaria from Pompeii, two columns have been produced to illustrate the effect of their inclusion in the overall vessel calculation.

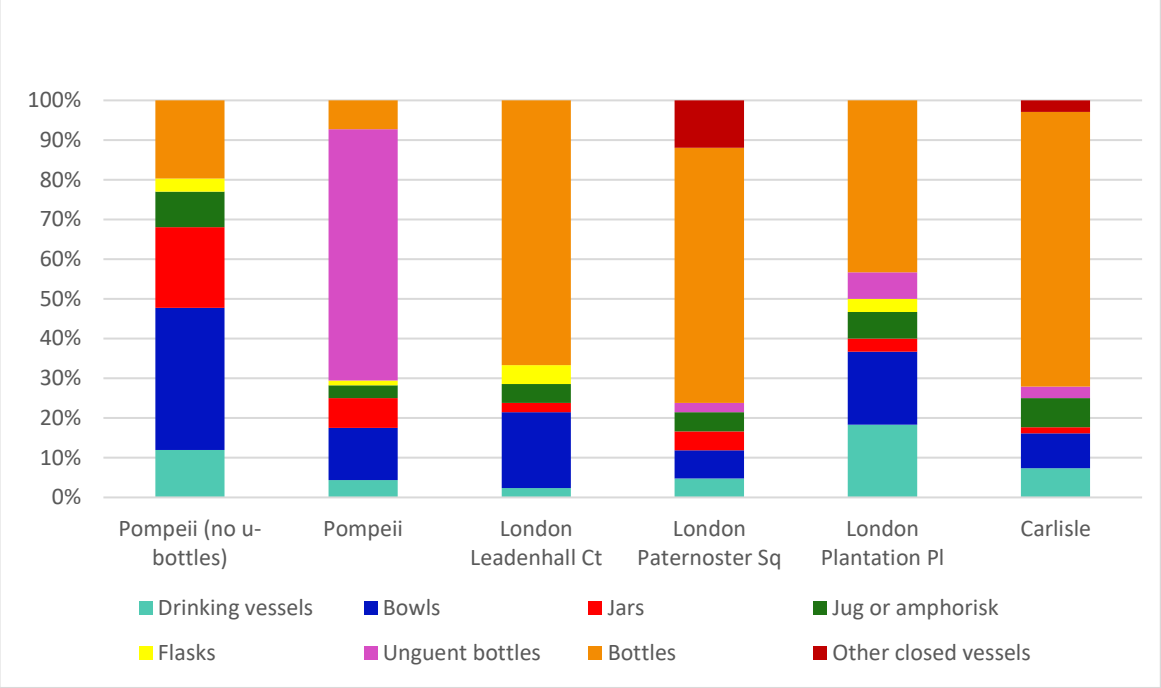


Fig. 4.6.19 General vessel forms from Band E (as % of total recognised forms)
(Pompeii is shown with and without the inclusion of 578 unguent bottles)

The contrast between unguent bottles and other form groups at Pompeii is striking and is not paralleled at any other site in this band or any other. There is no obvious reason for this disparity, but two strands of thought are worth consideration. Firstly, small body fragments of unguent bottles might be passed over unrecognised, whereas the complete vessels from Pompeii will all be registered. Furthermore, Pompeii is the only site in the data group (with the possible exception of some of the items from Cremona) where whole vessels have been preserved during their use, rather than as discarded items. It is tempting to link this distinct quality of the assemblage with the unusually high proportion of this

single vessel category. If so then it might be argued that unguent bottles were equally numerous at other sites, but were either less frequently broken (perhaps because of the value of their contents) or not disposed of in the same way as other glass vessels. This will be discussed further in relation to finds from other bands in Chapter 5.3.6. At the London sites and Carlisle, bottles are the largest single category of vessel. Bowls are generally more common than drinking vessels, though numbers are equal at Plantation Place. With the exception of Pompeii, bottles are more common here than in previous bands. At Pompeii, the relatively high number of unguent bottles seems to come at the expense of cylindrical and square bottles, which may indicate that some liquid products were being stored here in smaller containers.

D. Specific Vessel Forms

Several vessel types familiar from previous bands are missing or very poorly represented in band E. Convex wheel-cut cups, one the most consistently occurring drinking vessels in earlier assemblages are present in only very small numbers and the taller form of wheel-cut beaker on a solid base is missing altogether.

Only Pompeii has any variety in non-blown forms; there are ten distinct non-blown forms, including unusual vessels such as *pyxides* and two rectangular trays with handles. Amongst the mould-blown tablewares, sports cups are absent, though conical beakers occur at three sites. Pompeii shows a particularly wide range of mould-blown forms, including drinking vessels, decorated bottles an amphorisk and several varieties of unguent bottle. Tubular rimmed bowls were particularly numerous at Pompeii, accounting for nearly half the recognised blown bowl forms. The range of blown bowl types at Pompeii was remarkably limited, with vessel falling into three main groups; tubular rimmed bowls, convex bowls with out-turned fire rounded rims (comparable with Isings form 42) and straight sided bowls with fire rounded rims (comparable with Isings 41b). Whilst the exact profile and size of these bowls varied, they fall into these general types. Blown bowls of any type were extremely rare at the other sites. Large blown vessels with handles (modioli and canthari) were only present at Pompeii and in relatively small numbers.

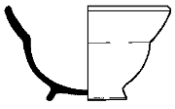
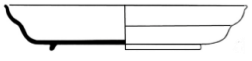
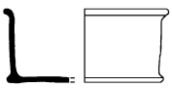
The most common forms of jug at Pompeii were ovoid and biconical jugs with wide necks and flared mouths and smaller globular jugs with a short constriction below the rim. None of these types was seen at any of the other sites, where only long-necked conical and globular forms (Isings forms 52 and 55) were noted.

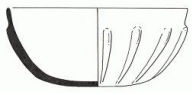
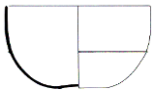
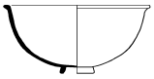
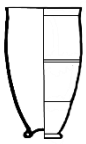
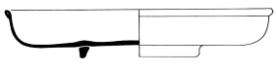
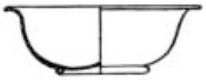
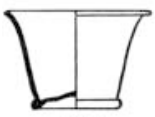
The huge number of unguent bottles from Pompeii has already received comment. Most fall into two general groups, with either tubular bodies, or slightly convex/ovoid bodies. The only unguent bottle form recognised elsewhere was the tubular unguent bottle.

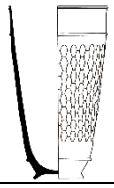
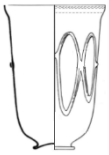
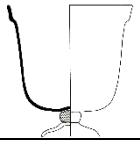
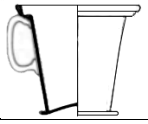
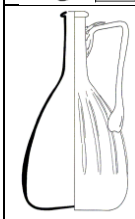
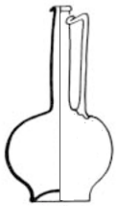
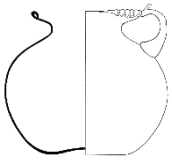
Jars with collar rims were noted in small numbers at all sites. The particular frequency of square jars at Pompeii perhaps highlights how difficult these vessels are to identify from small fragments at the other sites. The folded rims could come from jars of any shape, and the square bodies are indistinguishable from square bottles.

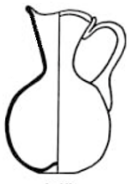
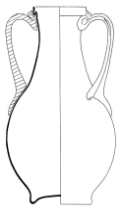
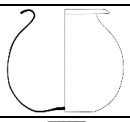
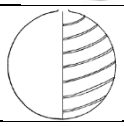
The square bottles from Pompeii appear to be produced according to two different techniques. Over half have no base pattern and have softer corner angles, suggesting they were not blown into a mould, but were flattened into a square form manually whilst still on the blowing iron, perhaps by being pressed onto a flat surface. The remaining square bottles were produced by the more conventional mould-blown method. There is no evidence that square bottles from any of the other sites were not mould-blown. Cylindrical bottles were less common than square on every site.

Table 4.6.9 Specific vessel forms, Band E

Form	Description	Pompeii	London, Leadenhall Ct	London, Paternoster Sq	London, Plantation Pl	Carlisle
Non-blown vessels						
	Carinated cup	4-5				
	Shallow carinated bowl	1				
	Cylindrical cup/bowl	2				

	Ribbed bowl	5	7	1	8	11
	Convex bowl		1		1	
	Scyphus	2				
	Convex bowl with base ring	3				
	Shallow bowl with base ring	1				
Mould-blown vessels						
	Beaker with raised motifs	6			1	1
	Mould-blown cylindrical cup	2				
Blown vessels						
	Wheel-cut cup	3		1	3	
	Beaker on tubular base	3				
	Tubular rim bowl	38		?1	1	
	Convex bowl, out-turned rim	28				
	Conical bowl	10				

	Facet/relief -cut beaker		1		2	
	Indented beaker	9		1		1
	Arcaded beaker				1	
	Cantharus	4				
	Modiolus	4				
	Conical jug	1			1	1
	Globular jug					1
	Short necked globular jug	5				
	Biconical/ovoid jug	11				

	Jug with spout	3	1			
	Amphorisk	1				
	Jar with collar rim	3	1	1	1	?1
	Ovoid/globular jar	15				
	Square jar	39				
	Ointment jar	5				
	Bath flask	4				
	Ovoid flask/unguent bottle	238				
	Piriform/globular unguent bottle	13				
	Bird-shaped unguent flask	1				
	Spherical unguent bottle	2				

	Tubular unguent bottle	193		1	2	1
	Conical unguent bottle	1				
Bottles						
	Cylindrical bottle	14		6-7	7	6
	Prismatic bottle	51	2	11	13	15

4.7 Band F late A.D.70s-late A.D.80s

4.7.1 Introduction

The assemblages presented in this band, with one exception, come from northern England and Scotland. The dating of these sites centres on the accepted dating of military activity in the region. Until recently, the chronological framework for the Roman army's movements relied heavily on the accounts of Roman writers, in particular that of Tacitus and the campaigns of his father-in-law Agricola (*Agricola* 22-39). According to this scenario, the military campaigns into Caledonia began in the very late A.D.70s, reaching the Tay in about A.D.79. The dates given for the foundation of Carlisle by dendrochronology have now pushed the military presence in that part of northern England to at least as early as A.D.72/3. This has led some commentators to question the accuracy of Tacitus' account and to propose a move into Scotland in the early-mid A.D.70s, whilst others are more supportive of the traditional timescale for the Scottish forts (see Hanson 2009, Shotter 2009 and Woolliscroft and Hoffmann 2010 for a detailed discussion of the arguments). For the purposes of this study, it seems unlikely that the glass assemblages from the Scottish sites would pre-date those from Carlisle, and the group from Elginhaugh seems to have a secure start date at the end of the A.D.70s. The glass assemblage from Inchtuthil can be firmly placed into the A.D.80s and others, such as Red House, Corbridge, are also likely to stretch into that decade. For these reasons the groups in this band, whilst not necessarily exactly contemporary, can be regarded as falling between the mid-A.D.70s and mid-late A.D.80s.

4.7.2 Band F Site Analysis

Camelon; Corbridge (Red House); Elginhaugh; Inchtuthil; Strageath; London GPO (Newgate Street); London, Leadenhall Court Period 3; London, St Swithin's House

Camelon (Fig.4.7.1)

The 1970s excavations at this fort are still in the process of being analysed, and no definitive answer can yet be given on the dating. However, it seems best to group the site for the purposes of this study alongside other lowland Scottish forts occupied in the late 1st century A.D, placing it from the mid-A.D.70s to mid-A.D.80s. A total

assemblage of 554 vessel fragments was recovered, 34 coming from contexts that have been assigned with confidence to the Flavian occupation, rather than the later phases of activity in the mid-2nd century. An unpublished report on the glass from Camelon (Price and Cottam forthcoming) was available for reference.

Period	Date	Recorded items
Flavian	Mid-A.D.70s-80s	34
Production method (excluding bottles)		
Non-blown	1	
Mould-blown	2	
Blown	18	
Colour (excluding bottles)		
Polychrome	2-3	
Dark blue	3	
Yellow/brown	1	
Blue/green	25	
Greenish-colourless	1	
Decoration (blown vessels)		
Ribs	6	
Wheel-cut lines	1	
Indents	1	
General vessel forms		
Drinking vessel	5	
Bowl	2	
Jug	1	
Jar	1	
Flask	3	
Unguent bottle	1	
Bottle	12	

Table 4.7.1 Summary of vessel attributes (minimum numbers) from Camelon

Non-blown glass is scarce in the earliest phases at Camelon with just one fragment from a blue/green ribbed bowl of Isings form 3 (Fig.4.7.1.a). A polychrome ribbed bowl was

also noted at the site, but was unstratified. There were two mould-blown fragments, one dark blue from a vessel that could not be identified with certainty, but which has irregular decoration similar to that found on an African-head beaker (Isings form 78a). The second fragment comes from a greenish-colourless indented beaker, with raised cordons around each indent (Fig.4.7.1.b). Three fragments of blown polychrome glass were found in Flavian contexts. Two are dark blue with opaque white splashes and may possibly be from the same vessel. The form is not certain, but the profile of the body is reminiscent of a bowl with tubular rim. The third polychrome fragment is from a convex vessel with an unusual mixed ground colour of blue/green and dark blue decorated with a marvered white blob.

Cups and beakers are the most common forms. In addition to the mould-blown vessels there is a blue/green convex cup with wheel-cutting and two blue/green cups with fire-rounded rims, one straight sided and the other convex (Fig.4.7.1.d and e). These last two vessels are of poorer quality than the other vessels in the group and show signs of inadequate annealing. In the draft report on the assemblage it is suggested they may be the product of local glassworking. Only one jug, a blue/green globular jug with spiral ribs (Fig.4.7.1.c), and one collar rim jar (Fig.4.7.1.f) were identified, as well as a small group of flasks and unguent bottles (Fig.4.7.1.g-i). Bottles made up over a third of the assemblage (Fig.4.7.1.j). However, this almost certainly underestimates the real proportion of Flavian-period bottles as bottle glass forms about 50% of the total 1st and 2nd century assemblage from Camelon and there were 129 fragments of cylindrical bottles in total from the site, fragments which must have derived from the 1st century occupation.

There is direct evidence for glass production at Camelon in the form of two or three fragments that appear to be moils, debris from the blown gather removed from the end of a blowing iron. Two came from a Flavian pit (which has some later contamination) which also produced other possible glassworking waste.

Corbridge, Red House (Fig.4.7.2)

Two groups of glass, from the fort and the contemporary bath house, have been combined here. Two short reports on the glass have been published (Charlesworth 1959a and 1979a) which list all the fragments recovered.

Assemblage	Date	Recorded items
Bath house	c.A.D.80-87	13
Fort/supply base	c.A.D.80-87	34
Total		47
Production method (excluding bottles)		
Non-blown	1	
Blown	15	
Colour (excluding bottles)		
Dark blue	3	
Yellow/brown	1	
Yellow/green	1	
Blue/green	8	
Colourless	3	
Decoration (blown vessels)		
Ribs	3	
Facets	1	
Indents	3	
General vessel forms		
Drinking vessel	5	
Bowl	4	
Jug	3	
Bottle	31	

Table 4.7.2 Summary of vessel attributes (minimum numbers) from Corbridge, Red House

There were three drinking vessels from the bath house, all indented beakers, two blue/green (Fig.4.7.2) and the other in poor quality yellow/green glass. The two beakers

from the supply base were both colourless, one decorated with facets, the other an indented beaker with applied cordons around the edge of each indent. This latter beaker appears to be a blown vessel (unlike the similar vessel from Camelon) and has a tubular pushed-in base ring. The bowls all came from the supply base site. Three were tubular rimmed bowls and the fourth a non-blown ribbed bowl (Isings form 3). There was a little strongly coloured glass at both sites. At the bath house there was a dark blue conical jug with ribs, and the base of a further dark blue vessel, described as flask or beaker. At the supply base, a dark yellow/brown fragment came from the lower body and open pushed-in base of a jar or jug. Two further conical ribbed jugs in blue/green glass came from the supply base. Both cylindrical and square bottles were present, as well as at least one hexagonal bottle.

Elginhaugh (Fig.4.7.3)

The fort at Elginhaugh on the North Esk river in Midlothian appears to have been a timber built auxiliary fort, probably occupied by a cavalry unit (Hanson 2007). It holds an important place in the wider discussion concerning the dating of Roman military activity in Scotland because of the discovery of a coin hoard in the *principia*, interpreted as a foundation hoard, which contains issues up A.D.77/8 (Hanson 2009). The latest stratified coins from the site are lightly worn and date to A.D.86. There is some indication that the area was used later, perhaps for animal collection, but there is no evidence for sustained military occupation after this point. The site is exceptional in that it was fully excavated in the 1980s. The glass assemblage is large and is dominated by bottle fragments.

Assemblage	Date	Recorded items
Fort and Annexe	Late A.D.70s-80s	41
Production method (excluding bottles)		
Non-blown	4	
Blown	19	
Colour (excluding bottles)		
Dark blue	2	
Yellow/green	2	
Mid blue	1	

Blue/green	15
Colourless	3
Decoration (blown vessels)	
Ribs	3
Wheel-cut lines	1
Facets	2
Trails	1
General vessel forms	
Drinking vessel	6
Bowl	6
Jug	5
Jar	2
Jar/jug	1
Flask/unguent bottle	3
Bottle	17

Table 4.7.3 Summary of vessel attributes (minimum numbers) from Elginhaugh

There is no polychrome glass in the group and only a small quantity of strongly coloured glass. There are eight fragments of non-blown glass, all from blue/green ribbed bowls of Isings form 3 (Fig.4.7.3.a and b) but no mould-blown tablewares. Blown tablewares are principally drinking vessels. There are two colourless beakers with facet cutting (Fig.4.7.3.c and d) and another colourless beaker with trailed arcading (Fig.4.7.3.e). There are no obvious examples of the sorts of wheel-cut cups and beakers familiar from earlier sites, such as Isings forms 12 and 34. Two further blue/green vessels, probably cups or beakers, are unusual. The first has a vertical fire-rounded rim (Fig.4.7.3.g) and the second is a small base fragment with a pontil mark, which suggests that it too had a fire-rounded rim. The poor quality of these vessels, which were produced in bubbly, streaky glass, may indicate local production (Price and Worrell 2007, 455). Blown bowls are not numerous. There is a dark blue tubular rimmed bowl (Fig.4.7.3.f), and a further yellow/green body fragment may come from a similar vessel.

One of jars identified is also dark blue and has a funnel mouth and fire-rounded rim and another blue/green jar is made of poor quality blue/green glass (Fig.4.7.3.h). There were

at least five jugs, all very likely to have folded rims, long necks and angular ribbon handles. Three were probably conical and two globular. Only three unguent bottles or small flasks were found, but bottles were very numerous. Bottles account for over 76% of the vessel fragment assemblage, and the minimum number given in the table above, based on observation of vessel size, colour and base patterns, is described by the excavation report authors as 'almost certainly a gross underestimation'.

Inchtuthil (Fig.4.7.4)

Construction of the legionary fortress began in the early A.D.80s, with a probable abandonment date of A.D.86 or early A.D.87 (Pitts and St Joseph 1985, 280). A group of 25 glass vessel fragments come from excavations at the beginning of the last century. These fragments have been re-examined by Hoffmann in association with the research of the Roman Gask Project (Hoffmann n.d.). Further major excavations took place from 1952-1965 (Pitts and St Joseph 1985), when more than 70 glass fragments were found and fully published (Price 1985a).

Assemblage	Date	Recorded items
Early 20th century excavations	Mid-A.D.80s	18
1952-1965 excavations	Mid-A.D.80s	26
Total		44
Production method (excluding bottles)		
Non-blown	1	
Blown	31	
Colour (excluding bottles)		
Yellow/green	3	
Blue/green	27	
Colourless	1	
Decoration (blown vessels)		
Ribs	3	
Wheel-cut lines	1	
Indents	1	
General vessel forms		

Drinking vessel	3
Bowl	1
Jug	8
Flask/unguent bottle	1
Bottle	18

Table 4.7.4 Summary of vessel attributes (minimum numbers) from Inchtuthil

Only one fragment of non-blown glass was found, from a blue/green ribbed bowl (Isings form 3). No polychrome glass was found, and apart from a little yellow/green glass and one colourless fragment, all the tablewares were blue/green. The 1985 report describes the assemblage as neither luxurious nor containing pieces of any rarity. Two fragments probably come from the same pale yellow/green wheel-cut cup of Isings form 12, noted by Price as a 'most unusual' vessel on Scottish Roman sites (Fig.4.7.4.a). A single colourless fragment, from an indented beaker came from the earlier excavations.

The assemblage is notable for the number of jugs in comparison to drinking vessels and bowls. Seven are in blue/green and one in yellow/green glass, and three are decorated with ribs (Fig.4.7.4.b). Three of the eight Inchtuthil jugs also show evidence for pinched trails extending down from the base of the handle onto the body of the vessel. Bottle fragments account for about half the vessel glass, with cylindrical examples very much more common than square. As at Elginhaugh, the calculated number of individual bottles is almost certain to underestimate the true quantity.

Strageath (Fig.4.7.5)

There are two main periods of military activity at Strageath, in the late 1st century and the mid-2nd century. The exact date of the fort is unclear, but it is difficult to picture a foundation earlier than that of Carlisle, so Flavian occupation might be safely suggested as stretching from the mid/late A.D.70s to A.D.87. The glass assemblage is very small, and it appears that much of the glass used in the 1st century was redeposited in later contexts. The fragment from a polychrome non-blown ribbed bowl for example, which comes from an Antonine context, is highly likely to have come to Strageath on the 1st century. Only fragments from secure Flavian contexts are listed here.

Period	Date	Recorded items
Flavian	Mid/late A.D.70s-A.D.86/7	6
Production method (excluding bottles)		
Blown	2	
Colour (excluding bottles)		
Dark blue	1	
Blue/green	2	
Colourless	2	
Decoration (blown vessels)		
Ribs	1	
Wheel-cut lines	1	
Facets	1	
General vessel forms		
Drinking vessel	2	
Jug/jar	1	
Flask	1	
Bottle	1	

Table 4.7.5 Summary of vessel attributes (minimum numbers) from Strageath

Six vessels came from distinct Flavian contexts. Two were drinking vessels and both of these were colourless. The first, a beaker decorated with oval facets, was formed from several fragments found in both Flavian and Antonine contexts, an indication of the residual nature of some of the glass at the site (Fig.4.7.5.a). The second, a slightly convex fragment decorated with horizontal wheel-cutting, was identified as being from a 2nd century vessel (Price 1989, 193, 198 no.6). The fragment is very small however, and given its context, the possibility that it is a first century vessel cannot be excluded. There was a fragment from a blue/green ribbed vessel, probably a jug or jar, and the rim and upper body of a globular flask (Fig.4.7.5.b). Only one bottle came from a firm Flavian context, but given the number of bottle fragments, of which a high proportion are cylindrical (68 fragments), many more must have been in use in the 1st century. A small chip of dark blue glass may relate to the one or two dark blue vessels found in Antonine contexts, but which are more likely to be 1st century in origin (Price 1989, 198 nos,13-4).

London GPO (Newgate Street) Period 6

Early glass from this site has been recorded in band B. After the Boudican destruction of A.D.60/1 there was a period of inactivity, with new buildings appearing 10-15 years later (period 6). This period, lasting perhaps 15 years, contained the largest group of glass from the site. Slag, burnt bone and charcoal found in a timber and clay building suggests industrial activity (Perring and Roskams 1991, 11-12).

Period	Date	Recorded items
GPO Newgate Street 6	A.D. 75/85-90	130
Production method (excluding bottles)		
Non-blown	12	
Mould-blown	2	
Blown	86	
Colour (excluding bottles)		
Polychrome	2	
Dark blue	6	
Dark green	2	
Yellow/brown	2	
Yellow/green	4	
Blue/green	83	
Colourless	1	
Decoration (blown vessels)		
Ribs	8	
Wheel-cut lines	4	
Indents	1	
General vessel forms		
Drinking vessel	6-7	
Bowl	14	
Jug	6-7	
Jar	4-5	

Jug/jar	2-3
Flask	2-8
Jug/flask/bottle	6
Unguent bottle	1
Bottle	30

Table 4.7.6 Summary of vessel attributes (minimum numbers) from London, GPO (Newgate Street) period 6

This assemblage is notable for the wide range of colours present, particularly the presence of polychrome and dark green vessels. The only identifiable polychrome vessel form was a dark blue non-blown ribbed bowl with opaque white and yellow roundels and rods. The other non-blown fragments were also ribbed bowls, all of which were blue/green. The two mould-blown drinking vessels were from sports cups, one showing a chariot-racing scene and the other with part of an animal, possibly a dog in the lower border zone. Drinking vessels were generally poorly represented, and the forms of only four others were recognised; three came from wheel-cut cups of Isings form 12, one of which was dark green, and the fourth was a blue/green indented beaker. One further dark green vessel, probably a small bowl or cup, was represented by a base fragment with a tubular pushed-in base ring. This vessel, and a yellow/brown tubular rimmed bowl were the only blown bowls identified in the group. The only colourless fragment came from an unidentified blown vessel.

Closed vessels were relatively numerous, with 11 examples of jugs and jars and at least three more that could come from either form. Five of these vessels were decorated with ribs. Bottles formed just under a quarter of the vessel assemblage with cylindrical and square bottles identified in roughly similar quantities.

London, Leadenhall Court, Period 3 (Fig.4.7.6)

Period 3 (c.A.D.75-80/5) excavations at the Leadenhall Court site in the City of London produced a significant group of glass. The period is dated by its stratigraphical position and associated finds, mainly coins and samian stamps (Milne and Wardle 1993, 33-4). Period 3 saw what the excavators describe as a ‘major urban development’ along a major road, leading north from the Thames and the forum. At least one building was a

relatively complex structure with interconnecting rooms, painted wall plaster and possibly a tiled roof.

Period	Date	Recorded items
3	A.D. 75/80/5	187
Production method (excluding bottles)		
Non-blown	14	
Mould-blown	3	
Blown	130	
Colour (excluding bottles)		
Polychrome	2	
Yellow/brown	1	
Blue	2	
Colourless	7	
Blue/green	67	
Decoration (blown vessels)		
Ribs	6	
Wheel-cut lines	6	
Facets	3	
Indents	4	
General vessel forms		
Drinking vessel	10	
Bowl	13	
Jug	14	
Jar	1-2	
Flask	7	
Unguent bottle	3	
Bottle	6 + 34 listed fragments	

Table 4.7.7 Summary of vessel attributes (minimum numbers) from London, Leadenhall Court period 3

The high level of preservation of the glass in Period 3, particularly fragments from the middens, is noted in the published report on the glass (Shepherd 1993). There are a few

vessels described as ‘luxury’ items, but much of the glass is utilitarian, with a high percentage of bottles and flasks. All the non-blown fragments come from ribbed bowls with one exception, a small colourless bowl with a convex lower body with a raised horizontal cordon and a low base ring. There are five further colourless vessels with external cut decoration. A tall beaker decorated with indents and facet cutting (Fig.4.7.6.a) is described as a ‘hybrid’ of facet-cut and indented beakers, and can be compared in some details with the cup from Xanten recorded in band D. A further beaker has ‘jigsaw’ and oval facets (Fig.4.7.6.b) and there are three further unidentified forms with exterior polishing.

There was very little polychrome glass with just two fragments recorded. The first is a polychrome non-blown ribbed bowl and the second a cased fragment from an unidentified vessel with an unusual colour combination of dark blue and purple.

Three mould-blown tablewares were identified; two were sports cups, one depicting a boxing match (Fig.4.7.6.c) and the other with a chariot racing scene. The third mould-blown fragment comes from a small bowl with alternating short vertical ribs and wheat-ear motifs below a latticed zone. Blown drinking vessels included three blue/green wheel-cut cups (Isings form 12) and three indented beakers, two with small tubular bases. Three vessels were described as canthari, one of which had a stepped rim with a fire-rounded edge.

At least four jugs were conical, one with spiral ribbing, and a further two jugs had pouring spouts. Only two vessels were identified as jars, one of which had a tubular pushed-in base which might also relate to other forms. Many bottle fragments were recovered and whilst a minimum of only three cylindrical and three square bottles could be securely identified, the true quantity of these vessels is probably very much higher.

London, St Swithin’s House (Fig.4.7.7)

The site lies between Walbrook and St Swithin’s Lane, north of Cannon Street in the City of London. Excavation took place in 1949 after war-time bombing. Machine-led excavation meant that precise recording of structures was not possible, and more attention was paid to smaller units such as wells and rubbish pits (Hume 1978, 14-16;

Wilmott 1991, 34). One of these, pit 14, produced eight glass vessels, several of which could be reconstructed. The pit, which was 5m deep and lined with planks at the base also contained a substantial quantity of mid-Flavian pottery (Wilmott 1991, 102, Fig.64-5, 67-70).

Period	Date	Recorded items
Mid-Flavian pit	A.D.80s	8 vessels (many fragmentary)
Production method (excluding bottles)		
Non-blown	2	
Mould-blown	1	
Blown	4	
Colour (excluding bottles)		
Blue/green	3	
Colourless/greenish colourless	4	
Decoration (blown vessels)		
Ribs	2	
Wheel-cut lines	1	
Indents	1	
General vessel forms		
Drinking vessel	1	
Bowl	3	
Jug	2	
Jar/jug	1	
Bottle	1	

Table 4.7.8 Summary of vessel attributes (minimum numbers) from St Swithin's House

It is not clear why such a large and contemporaneous group of ceramic and glass vessels was present in this pit. The range of forms is wide for such a small group and whilst some of the glass vessels are unusual, others are more common forms (Price 1991b, 165). There are two non-blown bowls, both pale greenish colourless. One is a scyphus

in high quality glass with detailed finishing. It has a vertical rim, carved handles with side supports, a cylindrical body and flat base with a low base ring (Fig.4.7.7.a). The second is a shallow bowl with convex sides and a low base ring (Fig.4.7.7.b). A further colourless fragment comes from a small bowl with pronounced mould-blown indents, each surrounded by a raised moulding (Fig.4.7.7.c). The colourless horn-shaped drinking vessel, or rhyton, is unusual (Fig.4.7.7.d). A blue/green undecorated example was noted at Pompeii, but this vessel has a cracked-off rim and is decorated with horizontal wheel-cutting.

All the other fragments are blue/green. There are at least two jugs, one undecorated with a globular body and angular ribbon handle (Fig.4.7.7.f). The other is conical and decorated with vertical ribs. A further convex ribbed fragment may come from a globular jug or jar (Fig.4.7.7.g). The final vessel is a mould-blown square bottle with a decorated base of ten concentric rings (Fig.4.7.7.h).

Fig.4.7 Vessels from Band F

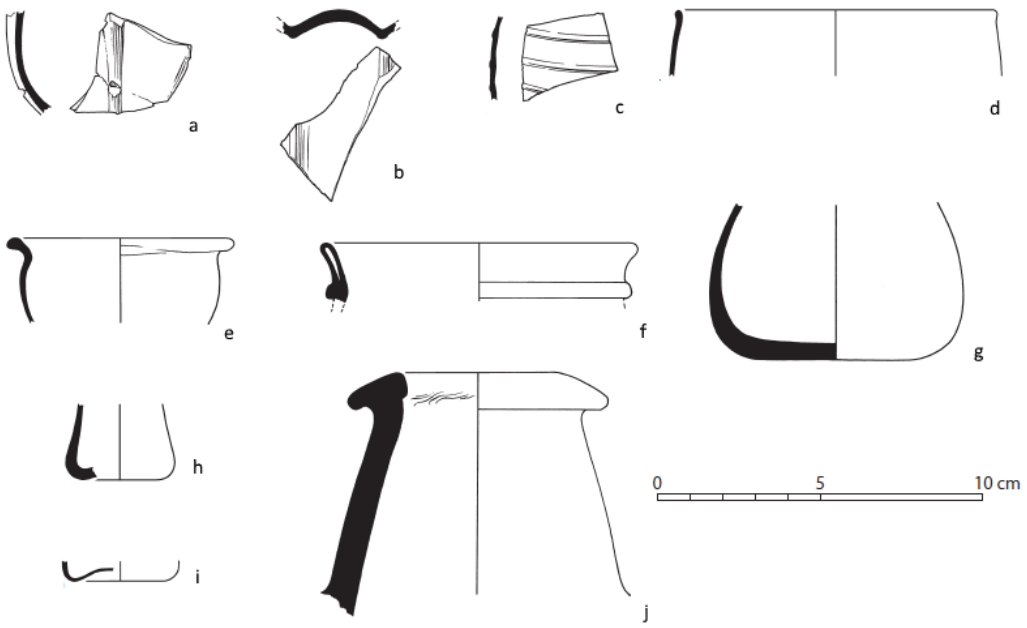


Fig.4.7.1 Glass from 1st century contexts, Camelon (Drawings courtesy V. Maxfield)

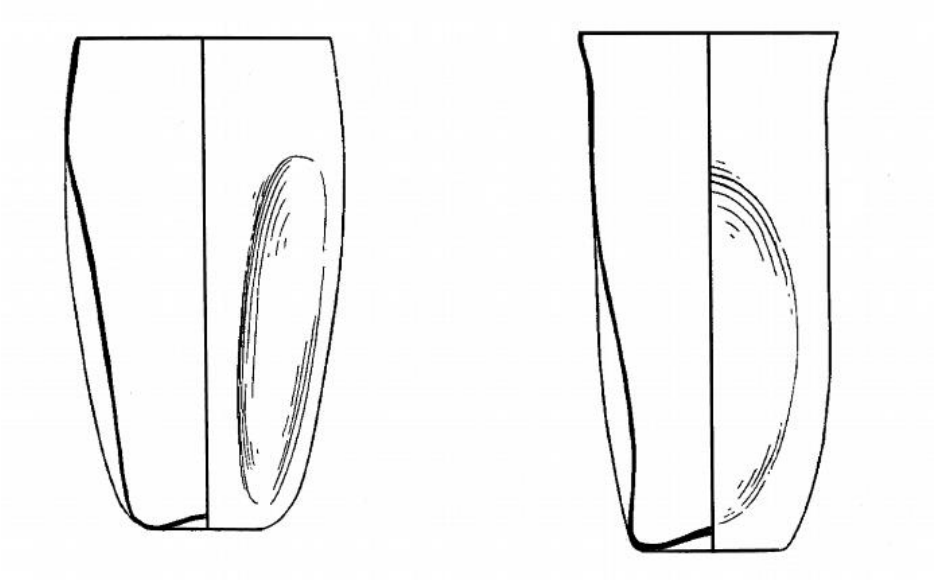


Fig.4.7.2 Indented beakers from Corbridge, Red House (after Charlesworth 1959a)

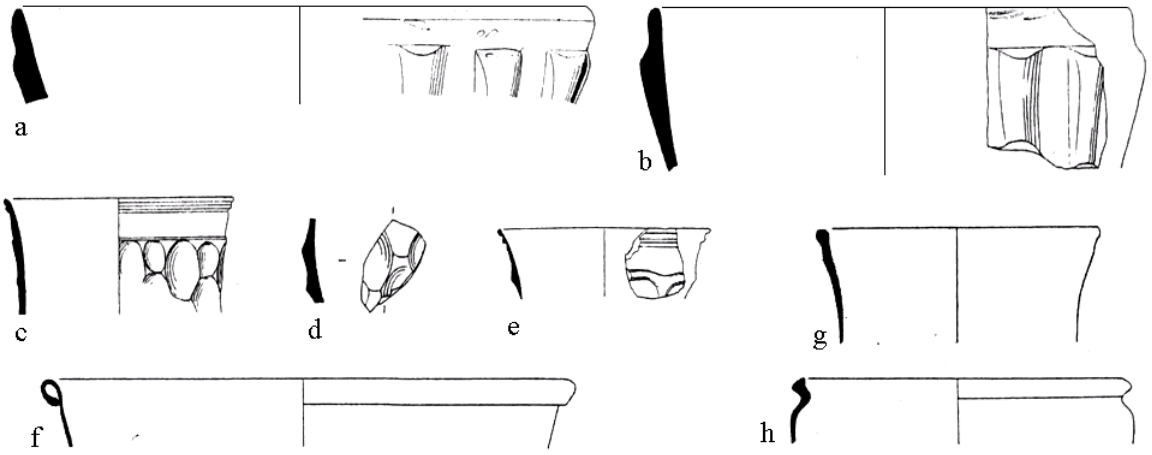


Fig.4.7.3 Vessels from Elginhaugh (After Price and Worrell 2007)

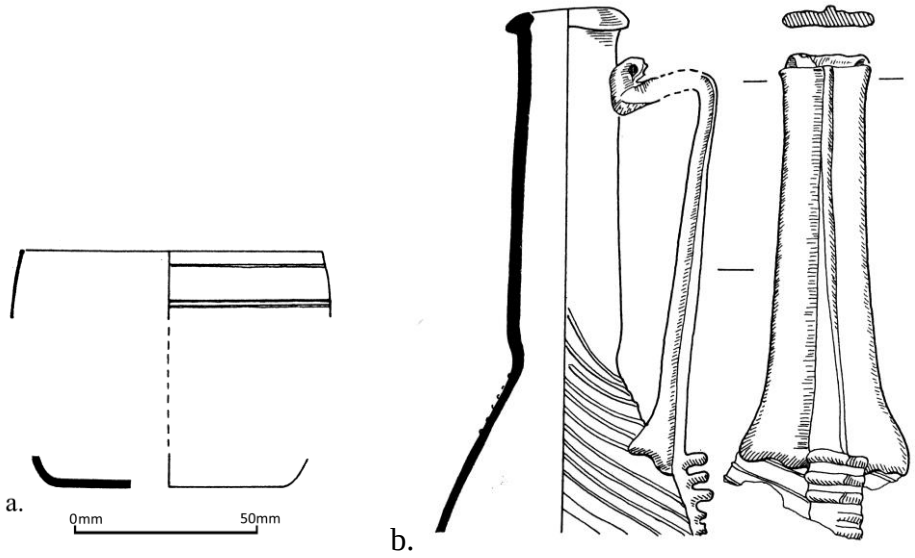
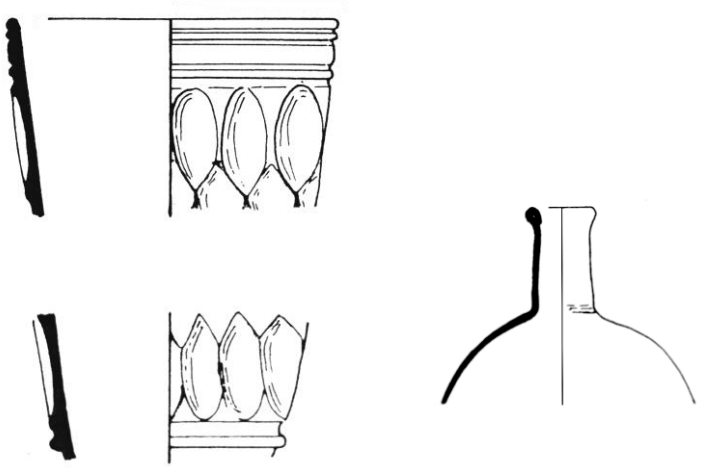


Fig.4.7.4 Vessels from Inchtuthil (After Price 1985a)



a b

Fig.4.7.5 Vessels from Strageath (after Price 1989)

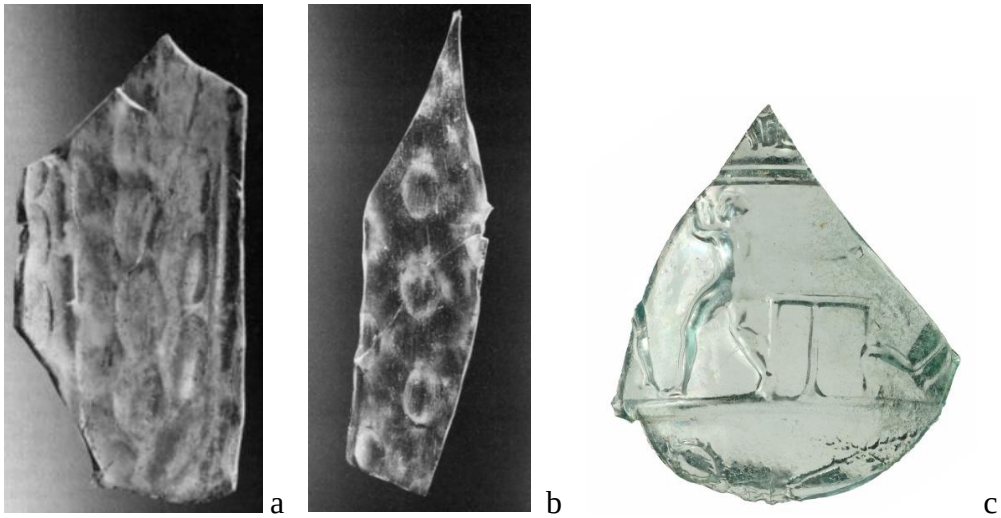


Fig.4.7.6 Vessels from London, Leadenhall Court period 3 (photos courtesy Edwin Baker and Museum of London)

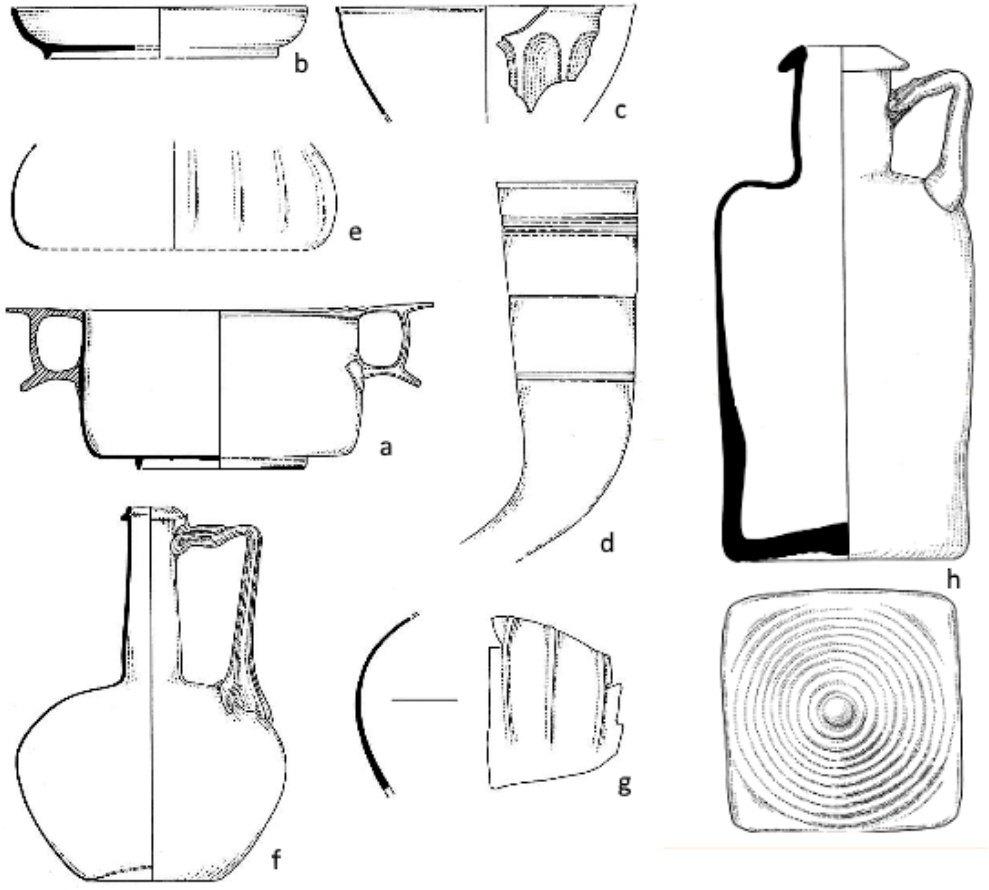


Fig.4.7.7 Glass from St Swithin's House, London (Adapted from original illustrations by Anne Jenner). 1:3

4.7.3 Review of the Glass from Band F

A. Manufacture

There was quite a marked difference in the numbers of vessels produced in the three main production methods. The group St Swithin's House stands out particularly for the high percentage of non-blown vessels relative to the size of the assemblage, but the small size of this sample exaggerates the impact of two non-blown vessels. The larger assemblage from Elginhaugh is more intriguing, as is has a higher percentage of non-blown vessels. The non-blown vessels from Elginhaugh, and from all the sites apart from St Swithin's House, London, are ribbed bowls of Isings form 3. These did not occur at St Swithin's House, where the non-blown vessels were both colourless and of much rarer type. Mould-blown glass was only present at Camelon and the London sites and whilst the relative quantities presented in Table 4.7.9 may seem significant, they only represent two vessels from Camelon and London GPO (Newgate Street), three from London, Leadenhall Court and one from London, St Swithin's House.

Site	Non-blown vessels	Mould-blown vessels	Blown vessels
Camelon (22)	4.8%	9.5%	85.7%
Corbridge (16)	6.25%	0	93.75%
Elginhaugh (41)	18%	0	82%
Inchtuthil (44)	3%	0	97%
Strageath (5)	0	0	100%
London GPO (Newgate St) (100)	9.23%	1.54%	89.23%
London, Leadenhall Court (147)	11.1%	2.2%	86.7%
London, St Swithin's House (7)	29%	14%	57%

Table 4.7.9 Manufacturing methods for tablewares for sites in Band F as a proportion of tableware assemblage, using minimum vessel numbers (in brackets)

B. Colour and Decoration

The range of colours in band F is distinctly narrower than in previous dated groups (Table 4.7.8). Dark green has almost entirely disappeared leaving dark blue as the most widespread of the strong colours. Polychrome glass is only present at Camelon and two of the London sites though a polychrome bowl from Strageath is probably a redeposited 1st century vessel in an Antonine context. Colourless glass occurs at all sites, but in very small amounts except at St Swithin's House where four of the seven vessels were colourless.

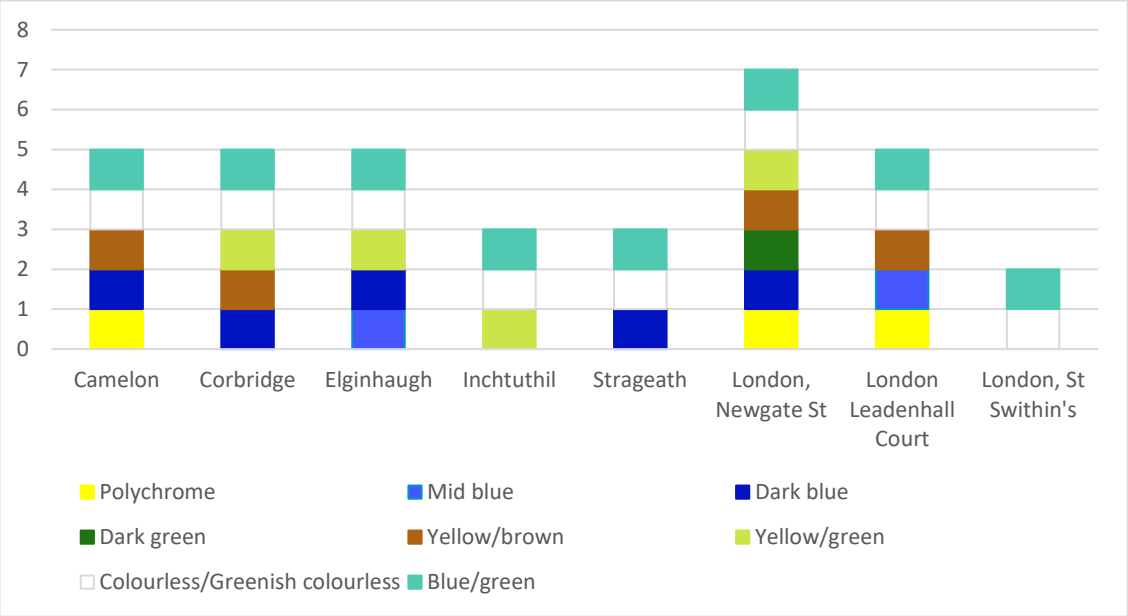


Fig 4.7.8 Colours present in Band F

There are only two polychrome blown vessels in this group, both from London, showing a further reduction from band E. One is an unidentified dark blue and opaque white vessel from GPO (Newgate Street), the other a cased vessel from Leadenhall Court. Amongst the decorated blown vessels (Table 4.7.10) ribbed vessels occurred at every site, and were nearly always jugs and jars. Indents on the other hand were used exclusively to decorate drinking vessels. The facet-cut vessels, all highly likely to have been drinking vessels, are either decorated with oval facets in interlocking rows, sometime quite closely set to form elongated hexagons, as at Elginhaugh, or with jigsaw facets as at Leadenhall Court. Leadenhall Court also produced an unusual vessel with both facet-cut and indented decoration, comparable with a beaker or cup from Xanten (Band D). Vessels decorated with horizontal wheel-cutting appear to be less common

than in earlier groups, probably a result of the reduced numbers of cups and beakers of Isings form 12 and 34.

	Indent	Trail	Rib	Facet	Wheel-cutting
Camelon			6		1
Corbridge	3		3	1	
Elginhaugh		1	3	2	1
Inchthuthil	1		3		1
Strageath			1	1	1
London, GPO (Newgate St)	1		8		3
London, Leadenhall Court	4		7	2	6
London, St Swithin's House			2		1

Table 4.7.10 Decoration of blown vessels in band F

C. Vessel Form

Closed vessels outnumbered drinking vessels at all sites with the exception of the St Swithin's House group in London (Fig. 4.7.9). Of these, bottles are the most numerous, even at Strageath where many 1st century cylindrical bottles were found redeposited in Antonine contexts. Military sites in Britain often have a high proportion of bottle glass, and the later 1st century sees the two main types of bottle, square and cylindrical, in contemporary use. In the Inchtuthil assemblage from the 1950s and 60s excavations there was only one square bottle fragment in contrast to the 35 cylindrical fragments probably representing six bottles. This prompted the suggestion that different military bases may have been supplied with goods in different shaped bottles (Price 1985a, 308). Unguent bottles were only present at Camelon and Leadenhall Court, and it is notable that the bath house site at Corbridge produced no unguent bottles or bath flasks. Jars were also generally rare, whereas jugs were present at every site except Strageath. It should be noted however that a dark blue handle fragment, perhaps from a jug, was found in an Antonine context at Strageath and may well come from a re-deposited 1st century vessel.

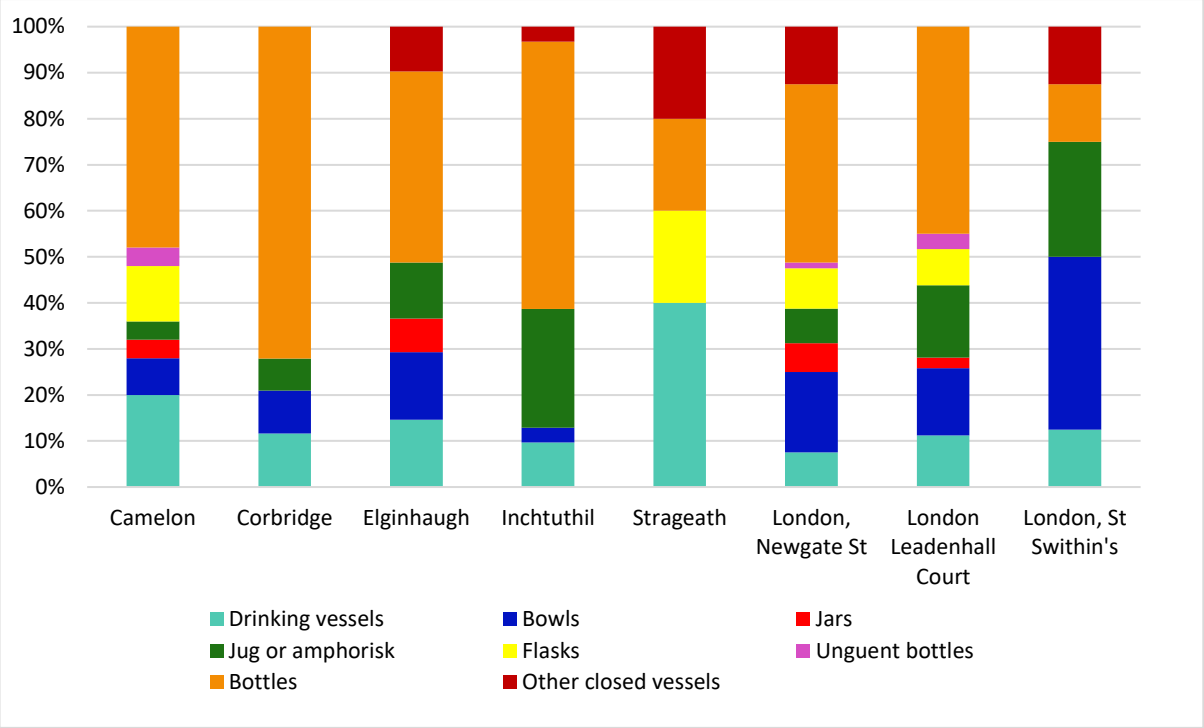


Fig.4.7.9 General vessel forms in Band F (as % of total recognised forms)

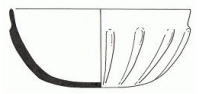
D. Specific Vessel Forms

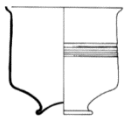
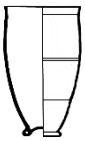
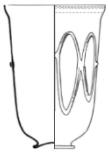
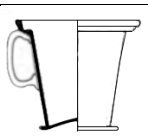
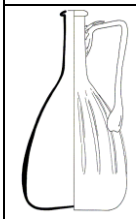
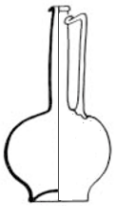
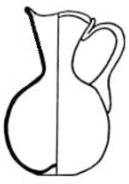
Many of the familiar forms from the earlier dated bands are rare or absent in band F. Convex wheel-cut cups (Isings form 12) were only represented by single examples from Camelon and Inchtuthil and two or three from London. The Inchtuthil cup is often cited as one of latest securely dated examples of this form and is regarded as either a late production, or a late survival, of a type which had largely gone out of use (Price 1985a, 303, 305-6). All wheel-cut beakers (Isings form 34) are absent, though taller drinking cups are still present in the form of indented beakers and an arcaded beaker. The only specific bowl forms recognised at more than one site are non-blown ribbed bowls (Isings form 3) and tubular rimmed bowls (Isings form 44/5). Large blown drinking vessels with handles were not identified with certainty at any of the sites, though they may be fragments from a possible modiolus and a cantharus at Elginhaugh.

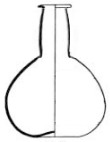
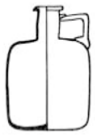
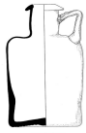
Vessels with rounded rims were present at Camelon and Elginhaugh. Their exact form could not be identified, but they were probably drinking vessels or small jars. This use of heat to finish the rim is not unknown on earlier vessels with handles (for example blown *scyphi*) but its use on individual drinking vessels is seen for the first time in this band (see Chapter 7.4.4 for further discussion of these rims).

Long-necked jugs, both globular and conical, were noted at several sites, and jugs with pouring spouts were present at London, GPO (Newgate Street) and Leadenhall Court. It is interesting to see that there were no examples of the wider-mouthed ovoid jugs seen so frequently at Pompeii. Both cylindrical and square bottles are present, and neither form seems to dominate. Hexagonal bottles are noted here with certainty for the first time.

Table 4.7.11 Specific Vessel forms, Band F

Form	Description	Camelon	Corbridge (Red House)	Elginhaugh	Inchtuthil	Strageath	London GPO (Newgate St)	London, Leadenhall Court	London St Swithins House
Non-blown vessels									
	Ribbed bowl	1	1	4	1		12	12	
	Scyphus								1
Mould-blown vessels									
	Sports cup						2	2	
Blown vessels									
	Wheel-cut cup	1			1		2-3	3	
	Tubular rim bowl	?1	3	1-2			1		

	Beaker with external cut decoration		1	2		1		2	
	Colourless wheel-cut cup					?1			
	Beaker on tubular base							?1	
	Indented cup/beaker		4		1		1	3	
	Arcaded beaker			1					
	Cantharus			?1				2	
	Modiolus			?1					
	Conical jug		3	3	4		1	4	1
	Globular jug	1-2		2	1				1
	Jug with spout						1-2	2	

	Jar with collar rim	1					3		
	Ovoid flask/unguent bottle	1							
	Bath flask							3	
	Tubular unguent bottle			1					
	Conical unguent bottle	1					?1	1	
Bottles									
	Cylindrical bottle	9	4	10	6		12-14	3	
	Prismatic bottle	11	6	6	3		10	3	1
	Hexagonal bottle		1	1					

4.8 Band G: A.D.85/90-100/120

4.8.1 Introduction

Three very large assemblages, from Plantation Place, London, Nijmegen and Barzan form the basis of this band which is dated to the very end of the 1st century A.D. and into the early 2nd century. They are complimented by two smaller groups from Leadenhall Court, London and Wroxeter. Finding securely dated groups becomes more difficult in the late 1st century. This may reflect a less turbulent period in the western provinces, with fewer major military campaigns, garrison movements and acts of revolt and destruction. Written evidence with links to archaeological activity also becomes scarce after the ending of the narratives of Tacitus and Suetonius, presenting greater challenges in connecting dated events with the archaeological record.

The groups presented here (Table 4.8.1) are dated by a combination of factors, linked to stratigraphic interpretations and associated dated material, principally ceramics and coins. Whilst this does not provide the sort of exact dated horizons seen in previous bands, the size of these assemblages compensates for this deficiency to some extent, giving a more representative picture of the sort of glass being discarded at this time.

4.8.2 Band G Site Analysis

London, Plantation Place Period 4; London, Leadenhall Court Period 5; Wroxeter, Drain Group; Nijmegen, *Canabae Legionis*; Barzan

London, Plantation Place period 4 phase 1 (Fig.4.8.1-2)

The defended area at Plantation Place appears to have been abandoned by c.A.D.85 and an east-west street reinstated. Further buildings were constructed, including one with mosaic pavements and painted plaster walls. There was some rebuilding and replacement work before the area was damaged by fire, perhaps the major Hadrianic fire noted elsewhere in London. The large group of glass in band G is dated to the beginning of this fourth period, which has been dated to c.A.D.85-120/30 on the basis of the associated ceramics and coins (Dunwoodie, Hazard and Pitt 2015, 79-102).

Period	Date	Recorded items
401	c.A.D.85-120/30	422
Production method (excluding bottles)		
Non-blown	21	
Mould-blown	2	
Blown	261	
Colour (excluding bottles)		
Polychrome	4	
Dark blue	7	
Mid/pale blue	2	
Dark green	1	
Yellow/brown	6	
Yellow/green	11	
Pale green	3	
Blue/green	210	
Greenish colourless	1	
Colourless	12	
Decoration (blown vessels)		
Ribs	20	
Wheel-cut lines	7	
Facets	1	
Trails	2	
Indents	1-2	
General vessel forms		
Drinking vessel	12	
Bowl	22	
Jug	13	
Jug/flask	13	
Jar	18	
Jug/jar	10	
Flask	12	
Unguent bottle	7	

Bottle	128

Table 4.8.1 Summary of vessel attributes (minimum numbers) from London, Plantation Place period 401

A large but very fragmentary group of glass came from period 4 phase 1. All three methods of manufacture were represented but there was very little non-blown glass and only two fragments from mould-blown tablewares. Nearly all the non-blown vessels were ribbed bowls (Isings form 3), of which all but three were blue/green. One of the very few polychrome pieces from this phase was from a dark blue ribbed bowl with opaque yellow and opaque white rods. Two further ribbed bowls were dark blue and yellow/brown. Three other non-blown vessels were noted. The first is a colourless bowl with part of a carved handle (scyphus) and with high quality finishing (Fig.4.8.1.a). There were two further polychrome non-blown vessels, both dark green with opaque yellow and red rods, one of which came from a plate or bowl with a flat base, perhaps with a base ring though this is missing (Fig.4.8.1.b). There was very little mould-blown tableware from this phase. Two fragments are from blue/green vessels, both probably beakers. One has part of vegetal scroll, the other lotus shaped and circular bosses (Fig.4.8.1.c).

The general lack of polychrome glass and strongly coloured glass is particularly apparent amongst the blown vessels. One fragment came from a dark blue vessel with opaque white splashes, there was one monochrome dark green vessel, perhaps a cup and seven fragments of dark blue vessels including a conical jug and a jar with a collar rim. Amongst the yellow/green and yellow/brown fragments the only vessel forms firmly identified are also jugs (three examples, one with diagonal ribs) and collar-rim jars (two examples).

The group of colourless fragments is also small. Apart from the scyphus and a possible bowl with facet-cutting, all the recognised vessel forms in colourless glass are drinking vessels. Of these the most intriguing is a fragment from a cup with a fire-rounded rim. Whilst fire-rounded rims occur on some late 1st century drinking vessels (see for example beakers and cups from Camelon and Elginhaugh (band F) and Nijmegen and Barzan (below)), in the case of colourless glass they are usually regarded as a feature of mid-2nd-3rd century vessels. Several fragments come from another colourless vessel, perhaps a cup or beaker, which appears to have a straight upper body and conical lower body, decorated with bands of close-set horizontal wheel-cut lines (Fig.4.8.2.a). There is a rim fragment

from a colourless cup or beaker with a polished outer surface and a horizontal cordon in relief below the rim. This feature is found on some facet-cut beakers, and it is possible that this vessel may have had facet-cutting further down on the body. Only one vessel however is certainly facet-cut, a small bowl with facets on the body and the underside of the base. (Fig.4.8.2.b).

There are only three blue/green blown drinking vessels, two wheel-cut cups (Isings form 12) and an indented beaker. Only one blown bowl was identified in the assemblage, a blue/green tubular rimmed bowl. Body fragments of blown bowls are difficult to recognise, and this may contribute to the seeming lack of examples in the assemblage. Their rims however are highly diagnostic, and if the number of rim fragments of tubular rimmed bowls is compared with the number of rim fragments of non-blown ribbed bowls, which are much the same diameter, the numbers still favour the ribbed bowls by a proportion of 9:1.

The Plantation Place group in general shows a marked trend towards jugs, flasks and jars over glass drinking vessels and bowls. There are at least two conical jugs, and one globular. Another jug has a pinched trail below the handle. Six blue/green collar-rimmed jars were identified, one with ribbed decoration, in addition to the one dark blue and two yellow/green vessels noted above, and there were two further jars, one with a fire-rounded rim and funnel mouth and one with a rolled-in rim edge.

Storage vessels were numerous. Twenty one vessels were flasks or unguent bottles, and this probably underestimates these generally undecorated vessels which can be difficult to recognise from body fragments. There were seven unguent bottles, three tubular and two conical. Bottle glass made up a large proportion of the group – about 30% of the total vessel count. The body shape of ninety of these could be identified, with square/prismatic bottle being nearly twice as numerous as cylindrical bottle fragments.

A small group of blue/green fragments were identified as being glass-blowing waste. Four narrow cylindrical pieces appear to come from moils (Fig.4.8.3), and four other fragments had the streaky bubbly and twisted characteristics of glass-working waste.

London, Leadenhall Court, Period 5 (Fig.4.8.4)

The contents of two middens (M12 and M15) were dated to period 5 (c.A.D.95-100). This very tightly dated period is associated with the construction phase of the basilica, part of London's major civic building development at the end of the 1st century and beginning of the 2nd century. The middens lie at the end of a strip building which had been in use for a number of years before being remodelled in the mid-A.D.90s. The excavators suggest that it was one of a series of administrative/accommodation buildings that could have 'housed the construction workers, providing site huts, canteens, refuse dumps…and storerooms' (Milne and Wardle 1993, 36)

Period	Date	Recorded items
5	c.A.D.95-100	68
Production method (excluding bottles)		
Non-blown	5	
Mould-blown	2	
Blown	52	
Colour (excluding bottles)		
Polychrome	1	
Blue/green	54	
Colourless	4	
Decoration (blown vessels)		
Ribs	6	
Wheel-cut lines	4	
Exterior grinding	2	
General vessel forms		
Form	Number recorded	
Drinking vessel	3-4	
Bowl	5	
Jug	3	
Jar	3	
Jug/jar	2	
Flask	?1	

Unguent bottle	1
Bottle	9

Table 4.8.2. Summary of vessel attributes (minimum numbers) from London, Leadenhall Court period 5

This group contains no strongly coloured glass with the exception of one fragment of a non-blown ribbed bowl in purple and opaque white. Despite the description of the area as a construction site, there is a relatively high proportion of tablewares, including some high-quality items. Four colourless vessels were found, three of which show evidence of high quality finishing. One is a non-blown wide rimmed bowl (Fig.4.8.4.a), a form that appears in some quantity across the Roman world from the late 1st century A.D-early 2nd century A.D. and is one of the last major classes of vessel produced by non-blown techniques (Grose 1991). Two of the other colourless vessels have exterior surfaces which have been ground and polished.

It is worth noting that not a single bowl from the assemblage is blown; the most common bowl form is the non-blown ribbed bowl (Isings form 3). There are two mould-blown vessels, one of which is a sports cup depicting a chariot race (Fig.4.8.4.b), a form usually classed as a product of the Claudian/Neronian period. The second is of uncertain form and decorated with circles. Two very different styles of jug are present; there is at least one conical ribbed jug which is likely to have had a long neck and angular handle. There is also a smaller jug with a pinched-in pouring spout and another short squat jug with a small angular handle.

Wroxeter, Drain Group (Fig.4.8.5)

Parts of a wood-lined drain were uncovered during excavations along the western side of Watling Street, to the east of the 2nd century forum and colonnade. In the fill of the drain (phase 3c) 169 fragments of glass were recorded. These came from the length of the drain, but there was a particular concentration in one area of fill (context 117). Several of the vessels were remarkably well-preserved and were probably in use immediately prior to breakage.

The drain dates to the period immediately after Wroxeter's legionary phases as the settlement developed into a civilian town (Ellis and White 2006, 71-72). The dating of period 3c derives from the analysis of the decorated samian ware, of which the earliest is early Flavian and the latest from the last decade of the 1st century A.D. (Wild 2006). The coarsewares may indicate a slightly later end date for period 3c than the samian, with some individual pieces being 'more typical of the Trajanic period' (Timby 2006, 102). A general date of the last decade of the 1st century A.D. into the first years of the 2nd century A.D. has therefore been proposed. Three drinking vessels account between them for 136 of the total fragments. A 4th century glass bowl is so clearly intrusive in this period (no 4th century ceramics were recorded) that it has been discounted.

Period	Date	Recorded items
3c	c.A.D.90-c.A.D.100	169
Production method (excluding bottles)		
Blown	169	
Colour (excluding bottles)		
Blue/green	4	
Colourless	5	
Decoration (blown vessels)		
Ribs	2	
Wheel-cut lines	4	
Trails	1	
Indents	1	
Chips	1	
General vessel forms		
Form	Number recorded	
Drinking vessel	5	
Jar/jug	1	
Unguent bottle	1	
Bottle	7	

Table 4.8.3 Summary of vessel attributes (minimum numbers) from Wroxeter

The importance of this group lies in three drinking vessels, preserved in complete profile which are likely to have been discarded at the same time. The first is a blue/green convex wheel-cut cup (Isings form 12) which has a high central kick in the base (Fig.4.8.5.a). The two colourless beakers are both high quality vessels which have been carefully decorated and finished. One has trailed arcading in diagonal loops the length of the body and a small tubular base ring (Fig.4.8.5.b). The other is an indented beaker with a concave base and additional decoration of small glass chips in relief on the body, which very unusual on a colourless vessel (Fig.4.8.5.c).

Other vessels are less well preserved. There are two further colourless cups, both from straight sided vessels decorated with horizontal wheel-cutting. A convex blue/green ribbed body fragment may come from a jug or jar and a lower body and base fragment came from a conical unguent bottle. At least three cylindrical bottles were present and there were four fragments from square bottles.

Nijmegen *Canabae Legionis* (figs.4.8.6-9)

This very large group of glass relates to the last years of the occupation of the legionary fortress at Nijmegen by the Tenth legion *Gemina* in the late 1st and very early 2nd century A.D. The Hunerberg hill was re-occupied after the Batavian revolt, having been abandoned earlier in the century and a stone fortress was built probably under Domitian. A civilian settlement grew around the fortress, and parts of these *canabae legionis* have been investigated as part of the Dutch Eastern River Project (Willems 1986). During these excavations, three pits in the eastern canabae were found to contain large quantities of broken glass. Given the evidence for industrial activity elsewhere at Nijmegen, it was suggested that this glass may have been brought together as cullet for re-melting. The fragments described as evidence of on-site glass-working certainly have all the appearance of glass-blowing debris (Isings 1980, 324-5 Fig.30 nos.1-14). Two intriguing fragments from the collection may also hint at glass working (Isings 1980, 307-8 nos.339-340 Fig.16, 12 and 13). These tubular pieces in streaky glass (Fig.4.8.9) are catalogued as neck fragments, but the quality and thickness of the glass and the small interior lip at one end may hint at an alternative interpretation as moils.

The glass appeared to have been deposited in a relatively short period of time, and stratigraphical analysis suggested that this happened late in the lifetime of the legionary occupation of Nijmegen (Bloemers 1980, 343). Dating the features was hindered by the theft from the site of many of the samian vessels, tiles, metal ware and coins. A preliminary list of the coins records that a coin of Domitian was found in the upper filling or sealing layer of one of the pits.

Period	Date	Recorded items
Late legionary occupation	c.A.D.90-105	c.2,200
Production method (excluding bottles)		
Non-blown	110	
Mould-blown	26 +	
Blown	c.2,070	
Colour (excluding bottles)		
Polychrome	7	
Dark blue	1	
Dark green	2	
Yellow/brown	2	
Yellow/green	10	
Blue/green	2445	
Colourless	33	
Decoration (blown vessels)		
Ribs	33	
Wheel-cut lines	c.65	
Facets	4	
Relief cutting	1-2	
Trails	c.30	
Indents	c.85	
General vessel forms		
Drinking vessel	187	
Bowl	408	
Jug	75	
Jar	64	

Jug/jar	5
Flask	19
Jug/flask	12
Bottle/flask	11
Unguent bottle	32
Bottle	247

Table 4.8.4. Summary of vessel attributes (minimum numbers) from Nijmegen *Canabae Legionis*

This is a huge assemblage and quantification of minimum vessels using any formula is unlikely to be absolutely accurate. However, the very detailed report (Isings 1980) lists diagnostic fragments and allows proportions of colours to be calculated as well as the ratios of different vessel forms.

Non-blown glass is relatively poorly represented, making up less than 5% of the total. Nearly all these pieces come from blue/green ribbed bowls of Isings form 3 (Fig.4.8.6). There are only seven pieces of polychrome glass recorded in the entire assemblage, and this is likely to be an accurate reflection of the total given the highly visible nature of these fragments. However, it could be suggested that polychrome fragments, and strongly coloured which are also scarce, might be extracted from a collection of glass being gathered together for recycling.

The collection of mould-blown glass is made up mostly of conical and cylindrical beakers. These show a variety of designs, some having scrolls and vegetal motifs, but most decorated with raised bosses, either circular or tear-shaped, and sometimes set within a diamond lattice (Fig.4.8.7). There was a single fragment from a blue/green mould-blown sports cup with a chariot-racing scene.

There was relatively little colourless glass in the assemblage, with most colourless vessels being drinking vessels. These include two beakers with facet cutting (Fig.4.8.8.c), three beakers with relief-cut motifs including raised circles, large raised ovals (Fig.4.8.8.b), and comma-shaped motifs, two beakers with trailed loops (Fig.4.8.8.a), an indented cup and six cups or beakers with horizontal wheel-cutting. One colourless base fragment came

from a non-blown bowl with a low base-ring. There are several neck fragments in colourless glass, but no indication as to the full form of the vessel.

Other forms of drinking vessel include wheel-cut convex cups of Isings form 12 (42 examples), blue/green wheel-cut beakers (7 examples) and indented cups and beakers (83 examples). One blue/green beaker has a fire rounded rim and vertical ribs on the body. Tubular rimmed bowls were common, with around 200 examples, overwhelmingly in blue/green glass.

One vessel form particularly dominant in this assemblage, accounting for more than 250 of the recognised vessels, has an out-turned rim with a fire-rounded edge and a convex body (Fig.4.8.8.d). No complete profiles were preserved and there is no indication of the form of base that these vessels might have had. Their exact function is also unclear as they have rim diameters of between 60 and 140mm, falling into the range which covers drinking vessels to small bowls. Some have a slight constriction below the rim, raising the possibility that they were used as jars. Isings makes the further suggestion that some might have been funnels or even lids (Isings 1980 ,288-9, 310).

Jugs and jars were well represented in the assemblage. Several of the more common forms were noted, including about 30 jars with collar rims, both conical and globular jugs, often with ribbed decoration. At least seven conical jugs have pinched extension trails below the handle. One example has a Medusa-head medallion, probably from the base of the handle.

There were 18 globular bath-flasks, one with pinched trails extending below the handles. Unguent bottles were rare in the assemblage and only one form could be identified with certainty, the tubular unguent bottle (Isings form 8) of which there were at least three examples. One of the few blown polychrome fragments also appears to be the neck of dark blue unguent bottle decorated with opaque white trails. Amongst the most unusual forms were three cylindrical containers with inverted mouths and looped handles (Isings form 77). These vessels are usually described as inkwells, but they may also have been used as containers for oils or other liquids.

The bottle fragment total almost certainly under represents the numbers present in this large assemblage. In her report, Isings does not attempt to quantify these vessels, often grouping unspecified numbers of fragments under a single catalogue entry. Square and cylindrical bottles were both recorded, with a rough fragment count of 60 cylindrical against 100 square bottles. Three fragments were identified as hexagonal bottles.

Barzan (Fig.4.8.10)

The village of Barzan lies on the northern shore of the Gironde estuary in the department of Charente-Maritime in south western France. Nearby are the remains of a large Roman town, the object of a series of excavations since the 1920s (Bouet 2011, 23-31). This assemblage comes from an area of public and private buildings situated between a Gallo-Roman sanctuary and the site of a large public bathhouse of the 2nd century AD. Over 2,500 fragments of glass were found during the excavations of this "secteur d'habitat" (Cottam 2011), 1478 of which came from a single deposit, a 20-metre deep stone-lined well. This self-contained and clearly delineated feature produced a closely dateable set of artefacts, including ceramics and coins. The latest coins come from the last decade of the 1st century AD, whilst the ceramics point to a date in the 1st quarter of the 2nd century. A date for the filling of the well of c.A.D.110 has been suggested (Bouet 2011, 202-8). Many of the glass vessels and ceramics survive in substantial portions. Parts of the same vessels have been found in different layers of the deposit, suggesting that the well was filled rather rapidly.

Period	Date	Recorded items
Single well deposit	c.A.D.110	370
Production method (excluding bottles)		
Non-blown	3	
Mould-blown	1	
Blown	249	
Colour (excluding bottles)		
Dark green	1	
Yellow/brown	2	
Yellow/green	34	

Pale green	31
Blue/green	233
Colourless	47
Decoration (blown vessels)	
Ribs	4
Wheel-cut lines	59
Facets	1-2
Trails	18
Indents	8
General vessel forms	
Drinking vessel	52
Bowl	11
Jug	3
Jar	11
Flask	14
Unguent bottle	4
Bottle	118

Table 4.8.5. Summary of vessel attributes (minimum numbers) from Barzan

Nearly all of the glass vessels were blown. There were no mould-blown drinking vessels and only three fragments came from non-blown vessels. These were two blue/green ribbed bowls and a small dark green bowl with an out-turned rim. Many of the most diagnostic fragments could be identified as coming from drinking vessels. Four types of blown drinking vessel predominated. These were blue/green undecorated cups with out-turned fire rounded rims (minimum 21 vessels), blue/green yellow/green and pale greenish cups with horizontal wheel-cut lines (minimum 19 vessels), blue/green or pale greenish cups with applied looped trails (minimum 5 vessels) and blue/green cups with indents (minimum 3 vessels).

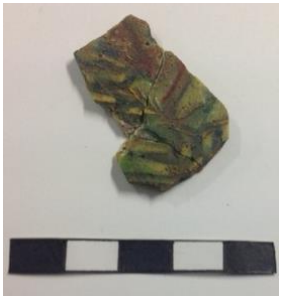
The beakers with out-turned fire-rounded rims are made of blue/green glass of generally good quality (Fig.4.8.10.a-b). One of the beakers (Fig.4.8.10.b) has a horizontal abraded line on the upper body, but all the others appear to be undecorated. No complete profile survives, but considerable numbers of applied base rings with pontil scars in similar

shades of blue/green glass were also found in the well and are likely to belong to the same vessels (Fig.4.8.10.c). Cups with cracked-off rims and horizontal wheel-cutting were also numerous. Most have cylindrical bodies and they are made in pale green, greenish or blue/green glass (Fig.4.8.10.d and e). These cups have much in common with wheel-cut cups of the later 1st and early 2nd centuries AD often recorded in good quality colourless glass. The examples in the well however were rather poorly produced. At least five beakers decorated with looped trails were found in the well (Fig.4.8.10.f and g). Cups and beakers with looped trails are fairly common in the western provinces during the later 1st and early 2nd century AD, most usually in colourless glass and decorated with thick trails. In contrast, the examples from the Barzan well are all pale green or blue/green and are characterised by the thinness of the wall of the vessel and the rather narrow trails. At least three cups were decorated with indents, and the considerable additional number of indented body fragments indicates that there were probably several more examples (Fig.4.8.10.h). These also have small tubular base rings. The well deposit produced very few glass drinking vessels that might be considered of good quality. Only a handful of cups were made in un-tinted colourless glass, and they show a distinct contrast in finish with the wheel-cut and trailed cups described above. One is a fragment with facet-cutting and three more are cups of unknown form but with separately blown feet.

Three of the four blown bowls in the well had tubular rims (Fig.4.8.10.i). Again, substantial parts of these bowls were preserved and they appear to have been broken only shortly before being deposited in the well. Five fragments could firmly be identified as coming from a minimum of three jugs of uncertain form. Jars however were very numerous, in particular small vessels with out-turned, often over-hanging rims with a rolled-in edge (Fig.4.8.10.j). At least five blue/green globular bath flasks with looped handles were discovered in the well, one with pinched trails extending down the body from the handles (Fig.4.8.10.k), similar to a vessel from Nijmegen noted above.

There are at least thirteen other flasks and unguent bottles, including a thin-walled two-handled flask that shows traces of a mould-blown body and may be from a vessel in the form of a bunch of grapes (Fig.4.8.10.l). There were 118 fragments of blue/green bottles and all the identified fragments came from prismatic, probably square bottles. A few are large, robust bottles, but most of the examples where the full width of the side is preserved are rather small, some only five centimetres wide (Fig.4.8.10.m).

Fig.4.8 Vessels from Band G


a

c

c

Fig.4.8.1 Non-blown and mould-blown vessels, London, Plantation Place Period 4.1


a

b

Fig.4.8.2 Colourless vessels, Plantation Place

Fig.4.8.3 Moil, Plantation Place


a b

Fig.4.8.4.a.Wide rimmed non-blown bowl b. Mould-blown cup from Leadenhall Court (2:1) (Drawings reproduced from Shepherd 1993)

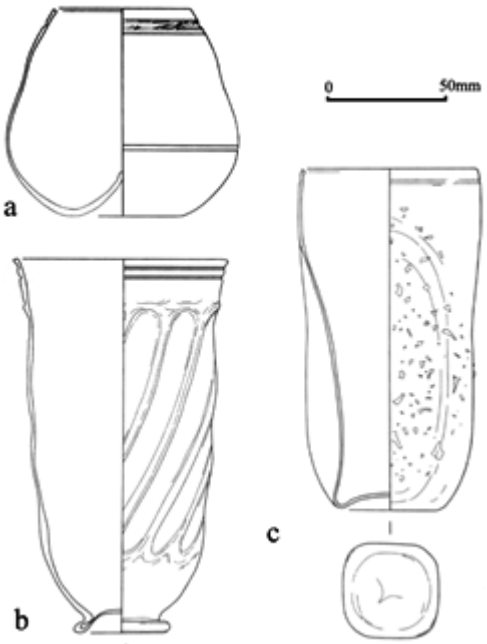


Fig.4.8.5 Vessels from Wroxeter © Y. Beadnell

Fig.4.8.6 Non-blown ribbed bowls from Nijmegen, *Canabae Legionis* (after Isings 1980)

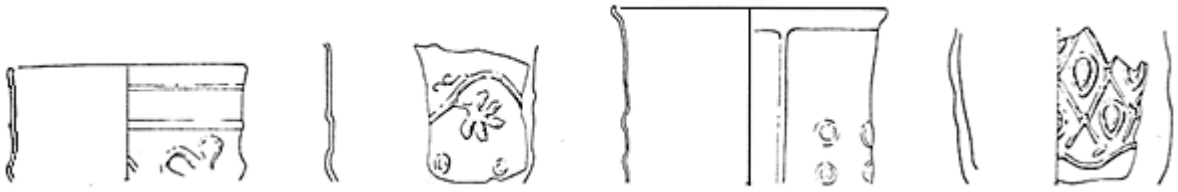


Fig.4.8.7 Mould-blown beakers from Nijmegen, *Canabae Legionis* (after Isings 1980)

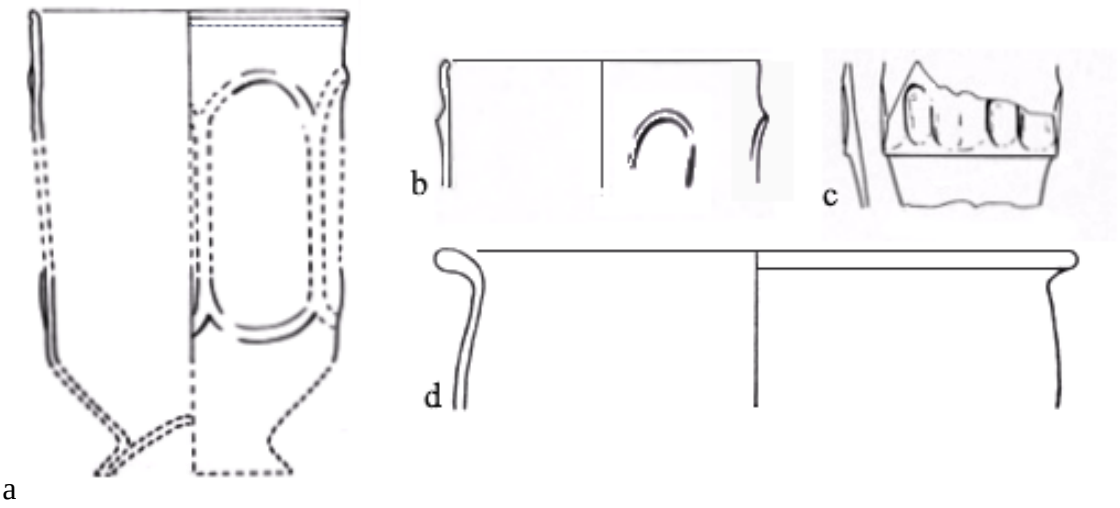


Fig.4.8.8.a-c Colourless beakers d.Blue/green cup/bowl with fire-rounded rim from Nijmegen, *Canabae Legionis* (after Isings 1980)

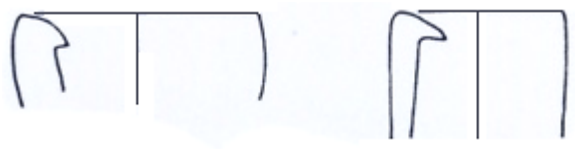


Fig.4.8.9 Glassworking waste from Nijmegen, *Canabae Legionis* (after Isings 1980)

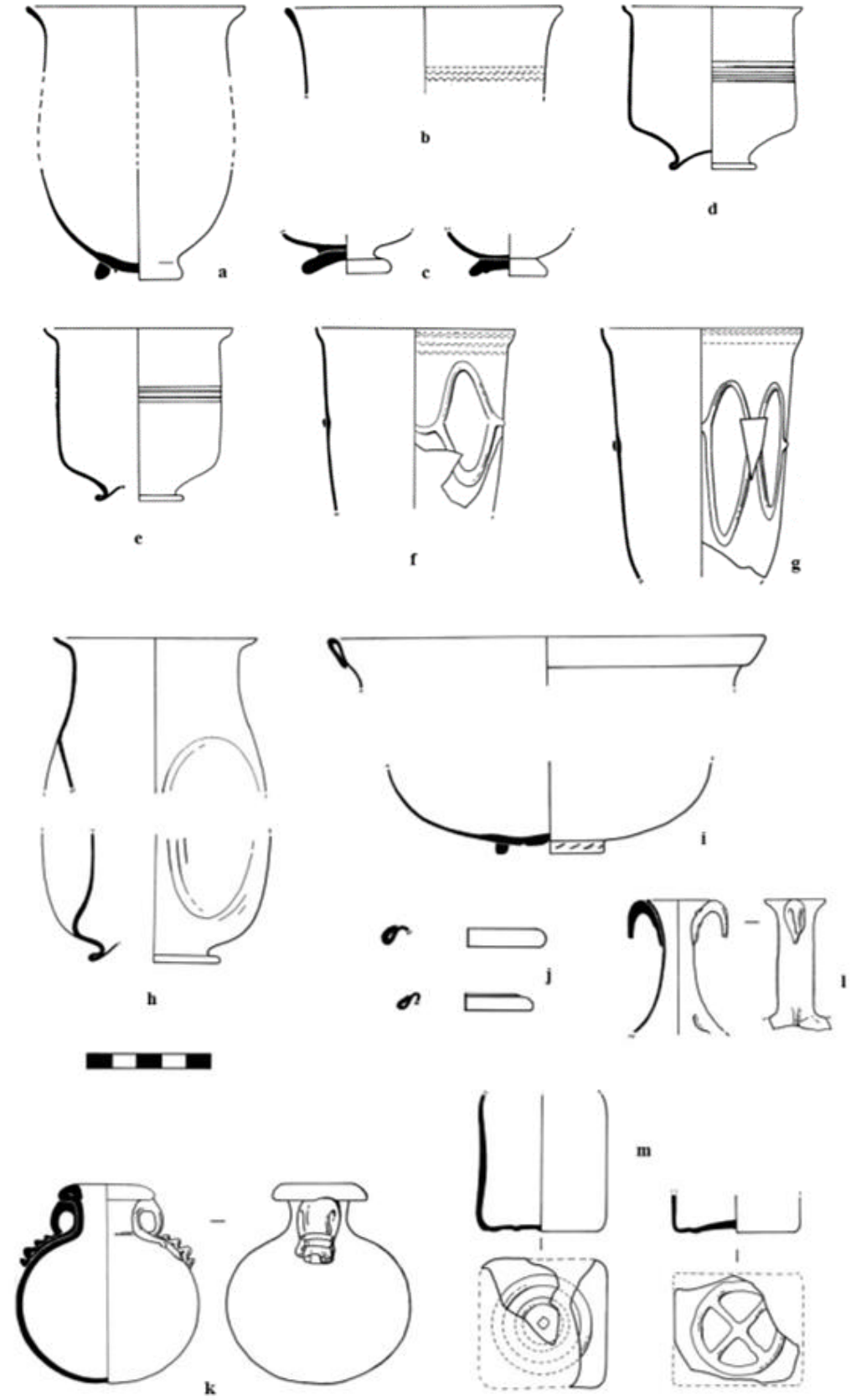


Fig.4.8.10 Vessels from Barzan

4.8.3 Review of the Glass from Band G

A. Manufacture

All the assemblages show the dominance of blown vessels over both mould-blown and non-blown vessels. In the three main assemblages, blown vessels form over 90% at each site, and non-blown and mould-blown vessels are entirely absent in the group from Wroxeter.

Site	Non-blown	Mould-blown	Blown
London, Plantation Place (370)	8%	1%	91%
London, Leadenhall Ct (59)	8.5%	3.4%	88.1%
Wroxeter (162)	0	0	100%
Nijmegen (1953)	5%	1.2%	93.8%
Barzan (252)	1.2%	0	98.8%

Table 4.8.6 Manufacturing methods for tablewares for sites in Band G as a proportion of tableware assemblage, using minimum vessel numbers (in brackets)

B. Colour and Decoration

Polychrome glass is still present though in only very small amounts at Plantation Place, Leadenhall Court and Nijmegen. Plantation Place and Nijmegen also produced the only vessels with dark blue glass, and strong colours were generally very rare, or absent at all sites. At Barzan for example there was only one fragment of dark green glass, from a small non-blown bowl, equivalent to 0.2% of the well deposit, whereas dark green was relatively well represented in earlier contexts, forming 5.6% of the total Barzan assemblage. At Nijmegen the number of dark blue, dark green and yellow/brown vessels was negligible, and yellow/green vessels were also scarce. Colourless glass occurred at all sites, and whilst levels were higher than for any of the strong colours, the proportion of colourless vessels was still relatively low.

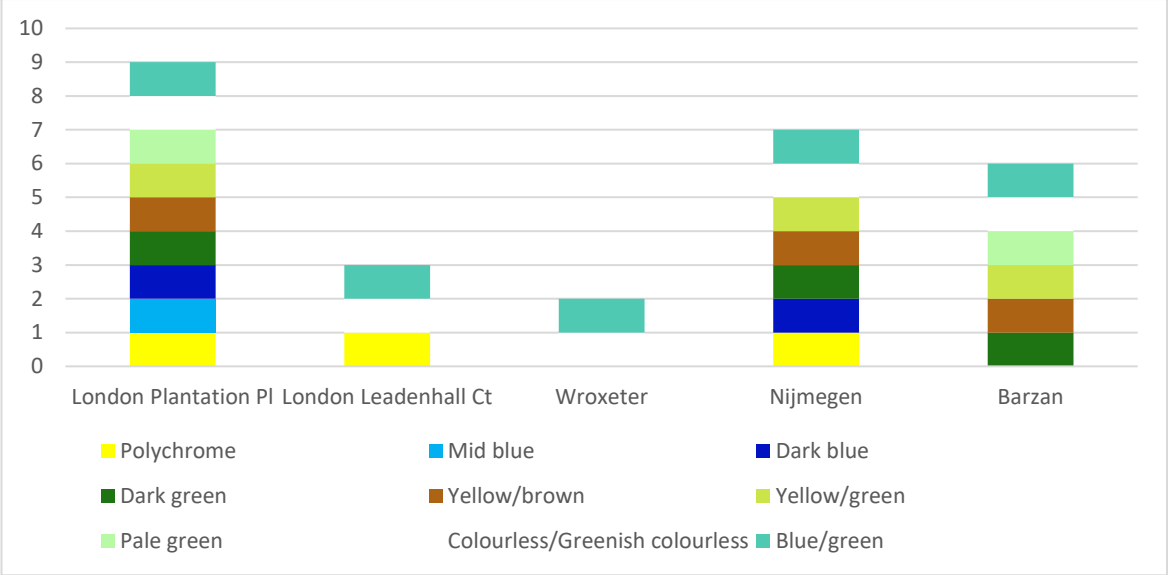


Fig. 4.8.11 Colours present in Band G

Vessels in this band G show a wide range of decorative techniques (Table 4.8.7), most of which were achieved in the first process of manufacture, whilst the vessel was still hot. The use of tiny unmarvered chips in combination with indents on the beaker from Wroxeter is most unusual, and is described by the report authors as being thus far unique in Roman Britain (Price and Worrell 2006, 95). Polychrome decoration on a blown vessel was only seen on one example, a jug or flask from Plantation Place. Ribs were almost entirely used on jugs and to a lesser extent jars, though individual beakers with ribbed decoration were present at Nijmegen and Barzan. Indented vessels, where identified, are beakers. Trails are mostly used to form loops and arches on cups and beakers and narrow horizontal or spiral trails are rare. Wheel-cutting occurs at all sites, but is noticeably scare in the group from Plantation Place. It is interesting to note that the incidence of wheel-cutting at Nijmegen is heavily reliant on the continuing occurrence of convex cups of Isings form 12, whilst at Barzan, where this form is absent, the high incidence of wheel-cutting relates largely to its use on straight sided cups with curved rims, considered a later form.

	Chips	Splashes	Fold	Indent	Trail/ Arcade	Rib	Facet/ relief	Wheel-cutting
London, Plantation Pl		1		1-2	2	20	1-2	7

London, Leadenhall Ct						7	1-2	4
Wroxeter	1			1	2	2		4
Nijmegen			6	85	31	33	5-6	65
Barzan				8	18	4	1-2	59

Table 4.8.7 Decoration of vessels in Band G

C. Vessel Form

Bottles are the dominant form at all sites except Nijmegen, which stands out from the other sites for the high proportion of bowls (Fig.4.8.12). The Nijmegen group is notable for the high number of small convex vessels with fire rounded rims that have been classed here as bowls, but may have had other functions, perhaps as drinking vessels or jars. The proportion of drinking vessels and bowls is particularly low at Plantation Place. Jugs barely feature in the well deposit from Barzan, which has a high proportion of cups and beakers only exceeded by the Wroxeter group. There are no firmly identifiable jugs or jars in the Wroxeter group, though a ribbed body fragment may come from one of these forms. Unguent bottles occurred at all the sites.

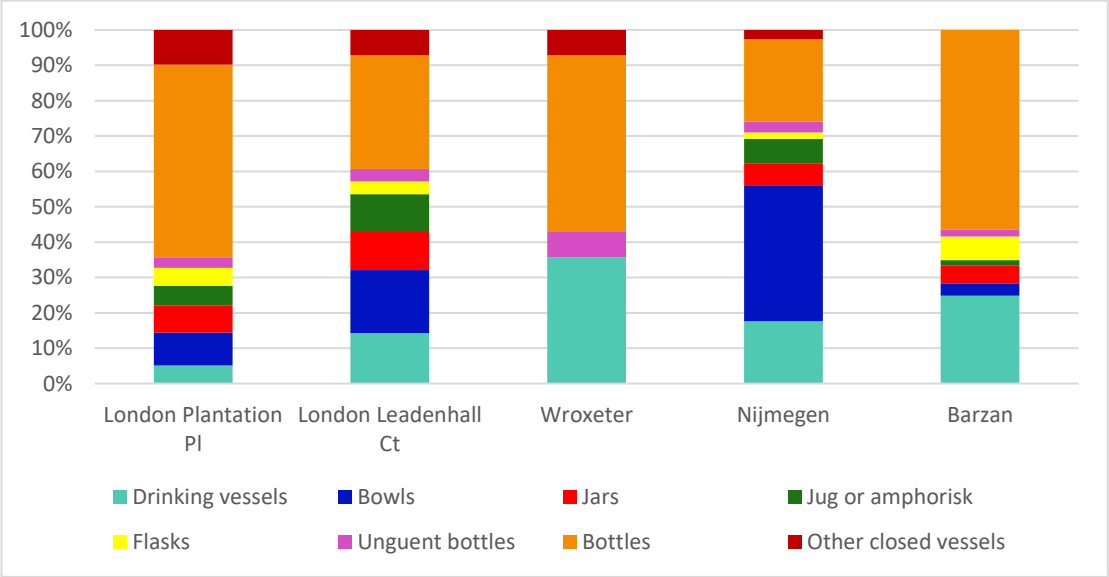


Fig.4.8.12 General vessel forms in Band G (as % of total recognised forms)

D. Specific Vessel Forms

The very large assemblage from Nijmegen has, as would be expected, the greatest variety of identifiable specific vessel forms. Several of these are forms that occur in earlier dated bands, but which have been becoming increasingly rarer in bands E and F. These include convex cups of Isings form 12, wheel-cut beakers of Isings form 34 and the mould-blown sports cup. The variety of recognised non-blown vessels in band G is restricted to ribbed bowls of Isings form 3, and a single colourless scyphus from Plantation Place. Mould-blown tablewares are almost exclusively beakers with a variety of decorative schemes, usually involving vegetal scrolls, geometric motifs and, most commonly, raised bosses.

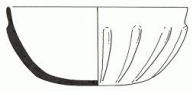
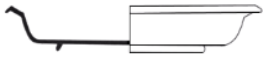
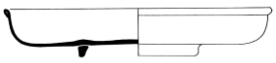
As the blown drinking vessel forms from earlier dated bands become rarer by the late 1st century their role is taken by indented beakers, cylindrical wheel-cut cups, beakers with looped and arcaded trails and, at Barzan and Nijmegen, vessels, usually undecorated, with fire-rounded rims. The increasing use of fire-rounding to finish tablewares marks an important shift in production techniques in the last decades of the 1st century (see Chapter 7.4.4).

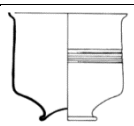
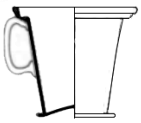
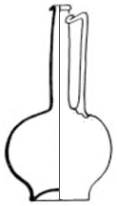
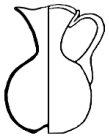
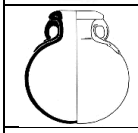
High quality colourless vessels with complex ground decoration remain rare in band G. Facet-cut vessels occur at all sites except Wroxeter, but are never common and at Nijmegen there are three fragments from vessels where the outside surface has decorative motifs in relief.

Globular jugs are less numerous than conical versions, though it is often easier to recognise conical forms, as straight sided body fragments expanding out are more distinctive than convex body fragments, which might also come from jars. Spouted jugs occur only at Nijmegen, though it is noted in the original report that fragments which might have been wasters were tentatively identified as pouring spouts. Small unguent bottles are uncommon at all sites, though there are rather more examples of slightly larger vessels probably used for similar purposes, such as bath flasks and miniature jars.

It is very telling that in the large group of bottle glass from the well at Barzan, not a single cylindrical bottle fragment was recognised. It should be also be noted that only one cylindrical bottle was present in the whole Barzan site assemblage.

Table 4.8.8 Specific vessel forms, Band G

Form	Description	London, Plantation Pl	London, Leadenhall Ct	Wroxeter	Nijmegen, *Canabae Legionis*	Barzan
Non-blown vessels						
	Ribbed bowl	18	4		70	2
	Wide rimmed bowl		1			
	Skyphos	1				
Mould-blown vessels						
	Sports cup		1		1	
	Beaker with raised motifs	1-2			30	
Blown vessels						
	Wheel-cut cup	3		1	42	
	Wheel-cut beaker with solid base		1		7	
	Tubular rim bowl	1			c.200	6
	Facet/relief - cut beaker	1	1		5	1-2

	Wheel-cut cup			2	6	19
	Indented beaker	1		1	84	3
	Arcaded/trailed beaker			1	2	5
	Modiolus				?1	
	Conical jug	2-3	?1		30+	
	Globular jug	1			2	
	Jug with spout		1		18	
	Jar with collar rim	9	3		30	
	Ointment jar					11
	Bath flask				18	5
	Tubular unguent bottle	3	1		3	

	Conical unguent bottle	2		1		
Bottles						
	Cylindrical bottle	35		3	60	
	Prismatic bottle	56		4	100	113
	Hexagonal bottle				3	

4.8.4 Summary

This chapter condenses information from 49 individual assemblages and presents it in a structured formula that allows cross-comparison between groups. The division into dated bands places assemblages in near contemporary use across a wide geographical area and allows smaller assemblages to contribute to the overall impression of glass use by combining data. There are occasions where large groups dominate, and this is most clear in the case of band E. Here, not only does the assemblage from Pompeii considerably outnumber the other assemblages in the band, but it is also fully diagnostic, with every item translating into an identified vessel form. In the light of this, the anomalies between Pompeii and other groups, such as the very high number of unguent bottles and flasks, need careful consideration, and this is taken into account in the following chapters.

The following three chapters explore different themes using the data from Chapter 4. In some cases it is possible to translate the data into graphs and figures that plot rates of change through time. These are most effective when used with data relating to aspects of glass that are readily identifiable from the fragments and which are numerically significant, such as colour groups. Features that are less statistically reliable, such as decorative techniques that occur in small numbers but that nevertheless corelate with

dated bands, are discussed in a more narrative style. Chapter 5 investigates the occurrence of vessel forms from bands A-G and assesses whether trends in vessel form and decoration emerge across the study period. Chapter 6 is devoted to the discussion of colour and examines the rise and fall of specific colours as well as the relative frequency with which they occur. Chapter 7 investigates changes in form, decoration and colour from the perspective of the manufacturing process and considers contemporary developments in the glass industry that may relate to these changes.

Chapter 5
Changes in Tableware Forms, A.D.40-100

5.1 Introduction

In Chapter 4, vessel form information was collected from individual assemblages, including methods of manufacture, general forms identified and specific forms of interest. Trends within each dated band were summarised at the end of each section. In this chapter the information will be collated across the dated bands to illustrate how vessel forms develop through the second half of the 1st century. Section 5.2 will look at production methods in use through this period and track the proportions of non-blown, mould-blown and blown vessels over time. The general method of manufacture may not have been immediately obvious to the end user of the product in antiquity, indeed occasionally these methods resist even the forensic attention of modern researchers. However, method of manufacture has important implications for the organisation of workshops, the speed and ease with which vessels could be made, the range of forms that could be produced, and the types of decoration chosen, all of which impact on the final vessel and its relationship with the consumer. Section 5.3 will examine general vessel form categories and specific forms of interest. The proportions of each form group as they change through the second half of the 1st century will be presented and discussed. Subsequent sections will examine each form group in more depth, identifying specific forms that demonstrate changes in aspects of production.

5.2 Methods of Manufacture

5.2.1 Non-blown vessels

Several manufacturing techniques probably fall into the general category of non-blown or cast glass. The polishing of the exterior surfaces of these vessels removes much of the evidence of how these vessels were formed, and this has meant that in some cases the exact processes involved are unclear. A re-evaluation of these techniques is outside the scope of this thesis, though it is important to emphasise aspects of the production of non-blown vessels that are likely to have a particular impact on the topics discussed here. These can be summarised as the skill levels involved in the multi-stage process of vessel formation and the efficiency of the production system and subsequent time and personnel

required. These points will be investigated in Chapter 7 along with other characteristics of the 1st century glass industry.

It has long been noted that until the early 1st century A.D. non-blown vessels were the most numerous, being overtaken by blown vessels in the first few decades of the century (Isings 1957 14-15; Grose 1977a, 27 and 1989, 241; Cool and Price 1995, 211-215; Fleming 1999, 31-35). An examination of the interrelationship of blown and non-blown glass during the 1st century A.D. has recently been completed in a doctoral thesis by Jonathan Prior (Prior 2015) which looked at five sites, Usk, Nijmegen, Xanten, Pompeii and Herculaneum and concluded that non-blown (cast) glass was not rapidly replaced in its entirety by free-blowing as a production technique during the course of the 1st century A.D. From the data brought together in the previous chapter, and the precision with which many of the sites are dated, it is possible to add additional observations about the changing nature of production processes.

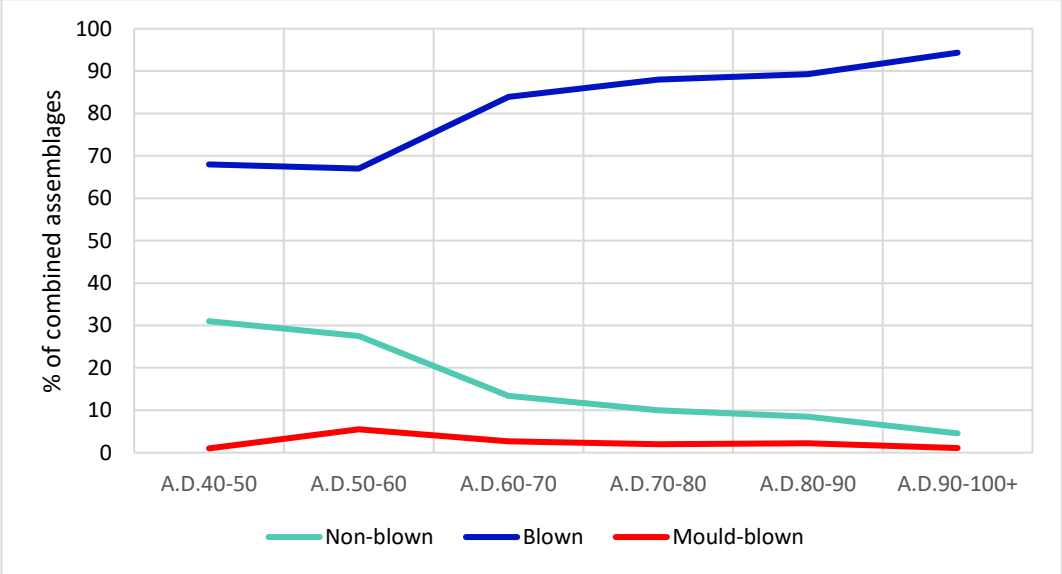
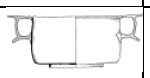
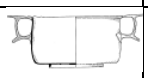
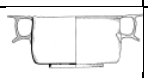
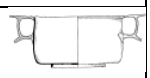
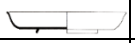
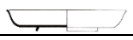
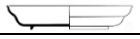
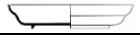
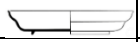


Fig.5.1 Proportion of tablewares produced in the three manufacturing techniques of the second half of the 1st century A.D., from the assemblages presented in Chapter 4.

For each site, the proportions of non-blown, mould-blown and blown glass were calculated as a percentage of the whole assemblage, and these were collated across each dated band. The pattern shown in figure 5.1 confirms the picture that there was no sudden abandonment of non-blown techniques, though there appears to be a slightly more pronounced drop during the A.D.50s-60s.

A further feature of the non-blown tradition is the significant reduction in the range of forms produced by the end of the 1st century. Table 5.1 shows the presence or absence of specific forms in each dated band. The pattern suggests that a wide variety of forms were still being used into the A.D.70s (Band E) with a marked reduction after this point. Whilst the actual number of non-blown items declined during the A.D.50s and 60s, the *variety* of forms was sustained for a further twenty years.

Band	A	B	C	D	E	F	G
1							
2							
3							
4							
5							
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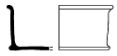
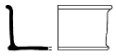
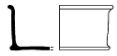
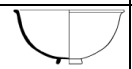
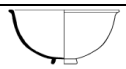
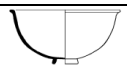
7							
8							
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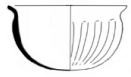
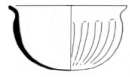
10							
11							
12							

Table.5.1 Presence/absence of specific non-blown forms within the dated bands of Chapter 4.

Key (left hand column): 1. Convex bowl with glossy outer surface 2. Shallow colourless bowl 3. Scyphus 4. Shallow bowl (Isings form 5) 5. Shallow carinated bowl 6.

Carinated cup (Isings form 2) 7. Cylindrical bowl (Isings form 22) 8. Small convex bowl on foot 9. Convex bowl. 10. Ribbed bowl with out-turned rim. 11. Ribbed bowl (Isings form 3) 12. Wide rimmed bowl/plate

However, a closer examination of the data reveals that just one site, Pompeii, is responsible for maintaining this diversity of non-blown forms into band E, despite non-blown vessels forming only 10% of the assemblage. The presence of 'fine-ware' forms such as Isings 2, 5 and 22, at Pompeii indicates that here at least these earlier forms were still in use. The Pompeii assemblage also featured two strip mosaic vessels, a type which would generally be considered a product of the first half of the 1st century A.D. No other band E site records any other non-blown form apart from ribbed bowls, with the exception of two convex bowls from London. However, the Pompeii group is very much larger than the other groups in band E, which might account for a greater range of forms.

5.2.2 Mould-blown vessels

Mould-blown tablewares are rare throughout the period, barely reaching 5% of the tableware assemblages even at their most numerous points in the A.D.50s and 80s (Table 5.2). Mould-blown tablewares are distinctive and easily recognised from fragments, and the likelihood that they are under-documented in the data is low. In his influential introduction to the chapter on mould-blown vessels in the volume accompanying the Glass of the Caesars exhibition, Harden states that mould-blowing 'once developed as a process, very soon began to be used prolifically by Roman glass-blowers in every region where they had major workshops. Examples of mould-blown vessels of the first century A.D. are so common all over the Empire that it is clear that they were very popular with the public of all classes'. (Harden 1987, 152). This may be true in the case of mould-blown bottles, but the data presented here cannot support this statement in the case of decorated mould-blown tablewares in the western provinces and ties more closely with the assessment by Cool and Price that 'mould-blown glass never represented more than a small part of the total amount of glass in use' (Cool and Price 1995, 43).

The technique of mould-blowing was most commonly used to produce square bottles. Mould-blown tablewares are usually drinking vessels and less frequently bowls, jugs and

flasks. The mould-blown tableware forms present in this data-set clearly show the degree to which this technique was geared towards the production of drinking vessels.

Description	Number of vessels
Sports cup	12-14
Convex/ovoid cup	3
Other mould/blown cup	2
Beaker with raised motifs	48-49/50
Beaker with indents	2
Ribbed bowl	8
Bowl with raised motifs	1
Indented bowl	1
Amphorisk	1
Unguent flask	5
Cylindrical bottle with raised motifs	2

Table 5.2 Numbers of vessels identified for mould-blown tableware forms from assemblages listed in Chapter 4

The very high number of beakers is influenced by the quantities from Nijmegen, but even without these, the beaker form would be represented by about 20 examples. There seems to be no immediate explanation for this preference for drinking vessels in the repertoire of mould-blown glass vessels.

Whilst the actual number of mould-blown tablewares is relatively small, it is by far the most common technique to produce intricate decoration on glass. Complex wheel-cut designs are rare and limited to cameo-cut vessels and high quality colourless vessels with exterior cut and ground decoration such as facet-cut beakers. Nevertheless, considerable skill was needed to produce the initial moulds for vessels with complex decorative schemes (Price 1991a, 57-58; Taylor and Hill 1998) and this may be one explanation for their relative scarcity.

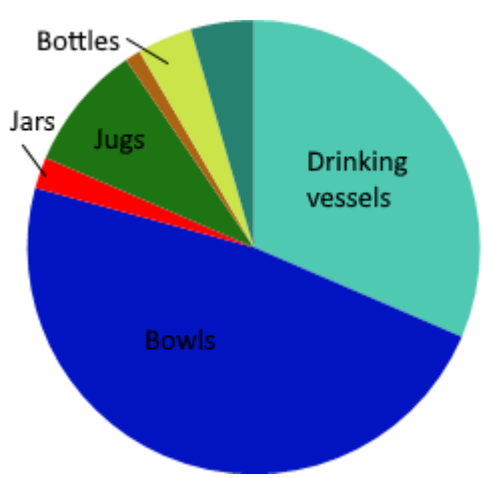
5.3 Major forms

5.3.1 General Form Categories

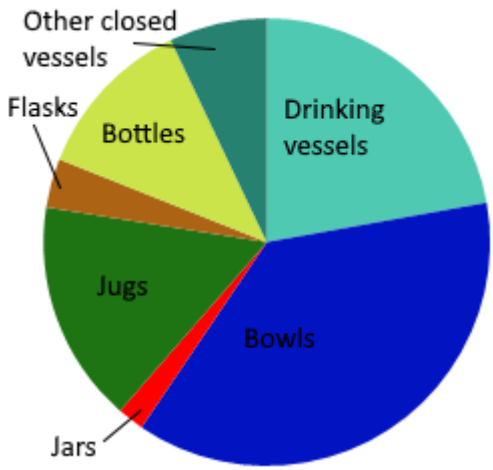
The data gathered in Chapter 4 allows the chronology of changes in the forms present to be monitored with precision because of the closely-dated nature of the contexts selected for inclusion. Figure 5.2 shows the relative proportions of each of the major forms within the dated bands A-G. The data for this figure is derived from sites that have been fully quantified, as listed in Chapter 3.12.

In one instance the presence of a specific form has a strong influence on the data - the small blue/green convex vessels with fire rounded rims which are found in very large quantities at Nijmegen (Isings 1980, 288-308-314 figs.16-21). Over 250 examples were found, and they were considered by Isings to be difficult to classify, being perhaps cups or small bowls, with some possibly jars or funnels. These vessels clearly represent an anomaly as they are found in huge quantities at Nijmegen but are not a form represented on other sites (although there were beakers with fire-rounded rims in the well group from Barzan another band G site). For this reason, two charts, with and without this form, have been included for band G in Fig.5.2. Unguent bottles have also been excluded from these charts, as the very large quantities from Pompeii impact heavily on how the proportions of other forms appear visually. Specific information relating to unguent bottles is presented separately later in this chapter.

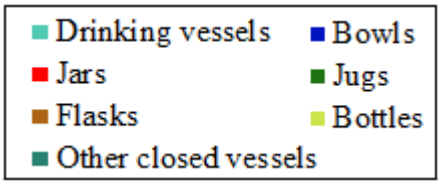
Fig.5.2 Proportions of forms across each dated band



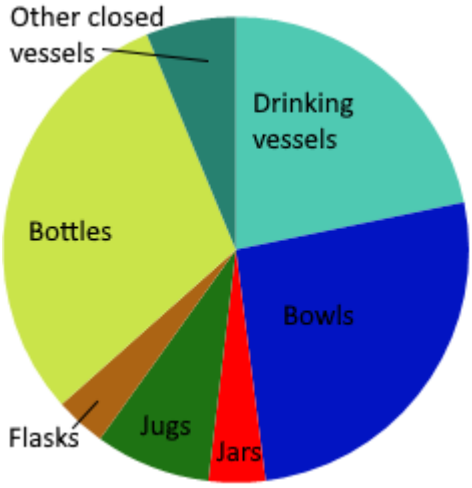
Band A (c.A.D.40-55)



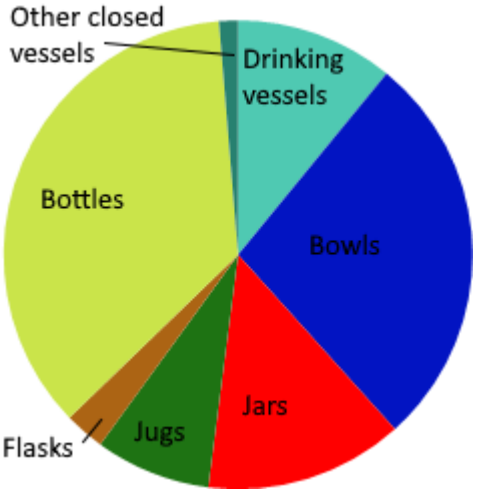
Band B (c.A.D.50/55-60)



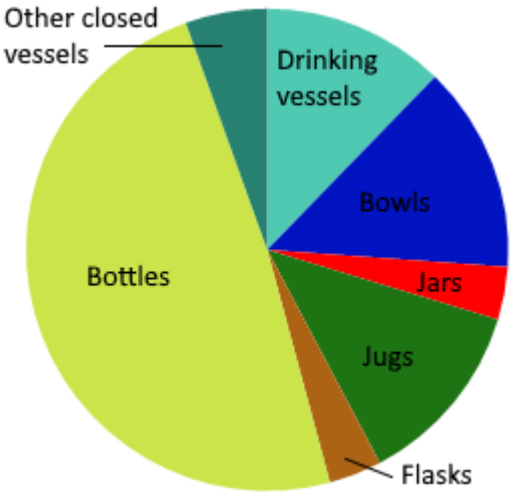
Band C (c.A.D.40-60)



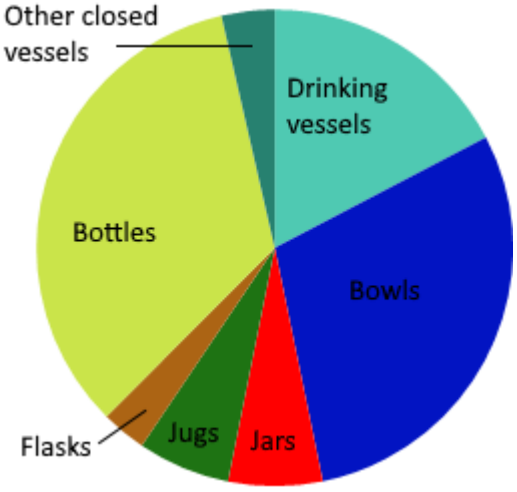
Band D (c.A.D.60-70)



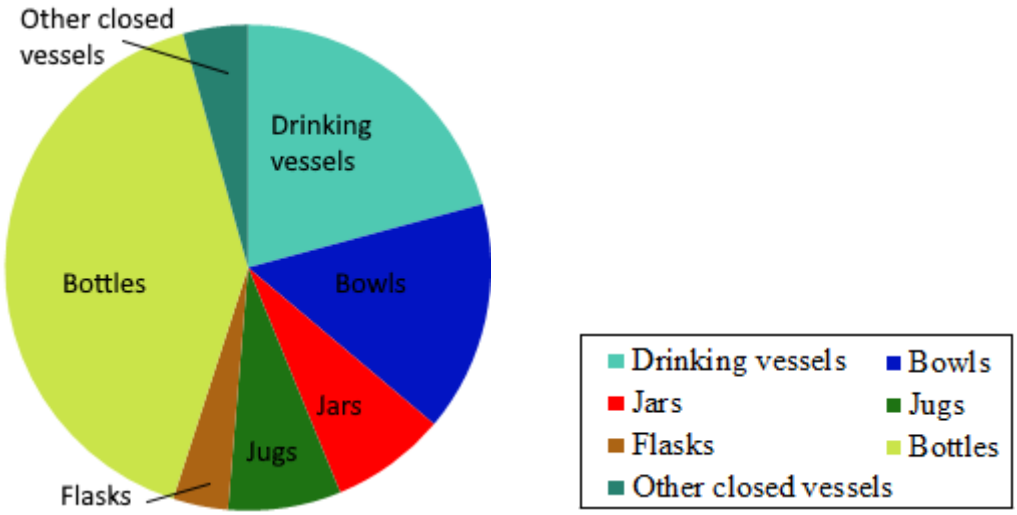
Band E (c.A.D.70-80)



Band F (c.75-85/90)



Band G (c.85-100+)



Band G (with Nijmegen cups/bowls excluded)

One of the most striking trends is the increase in the proportion of bottles present. By the end of the 1st century, bottles form over a third of the combined vessel assemblage (Band G). This however does not represent their peak, which comes slightly earlier, in band F. The most significant change however appears to come in the years spanning A.D.50-70 (Bands B and D) when bottles triple as a proportion of the total assemblage from just under 10% to around 30%). The small quantities in band A (c.A.D.40-55) and the more widely dated band C (c.A.D.40-60) would seem to confirm that bottles only begin to be discarded in quantity from the mid-late Neronian period onwards.

If bottles are removed from the data (figure 5.3) a clearer picture of the trends in tablewares appears. Here the individual dated bands are shown with the proportions of the four main categories of tableware – drinking vessels, bowls, jugs and jars. A fifth group, closed vessels, has been included to cover the many fragments which clearly come from either jugs or jars, but which cannot be precisely identified (these tend to be lower body and base fragments). Band C which covers the broader period of c.A.D.40-60 has also been omitted.

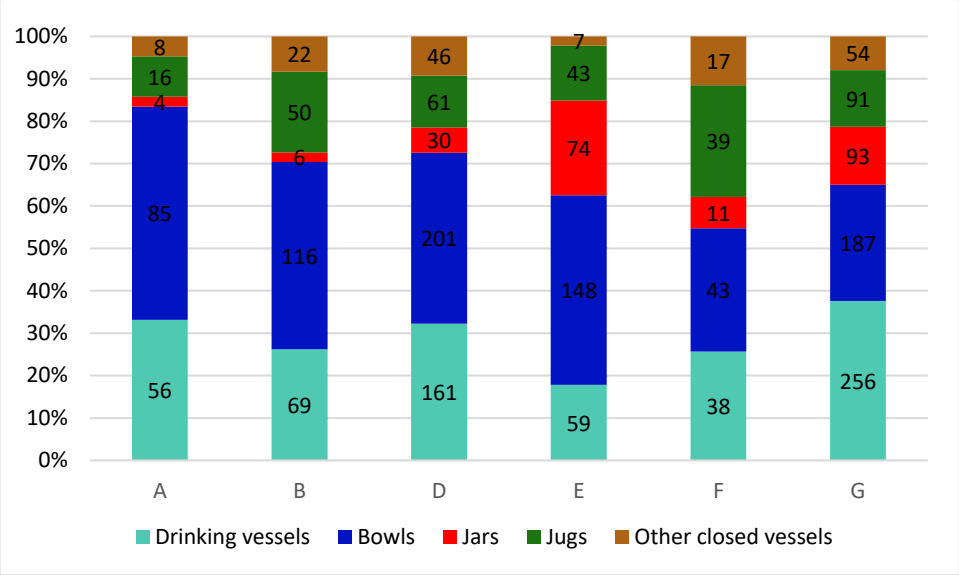


Fig 5.3 Proportions of different groups of tablewares across the dated bands with minimum vessel numbers (Band C omitted; Band G has cups/bowls with fire rounded rims from Nijmegen excluded)

A point of particular interest is the small but distinct overall increase in the proportions of jugs and jars across the study period. From around 17% of the assemblage in the earliest years, these forms gain more prominence during the Flavian period, with a slight reduction in the last years of the 1st century and beginning of the 2nd century. Jugs are the most dominant of these 'closed' forms with the exception of band E where jars are particularly numerous, and band G where jugs and jars are almost at parity.

The data concerning the relationship between two main categories of tablewares, drinking vessels (cups/beakers) and bowls are intriguing. Both categories are present in significant quantities throughout the period of study and there is a slight decline in the proportion of these vessels against other tableware categories as the decades progress, especially if the ambiguous vessels from Nijmegen in band G are put to one side. When drinking vessels and bowls are directly compared (figure 5.4), there appears to be an overall decline in the proportion of bowls, which switch from being slightly more dominant than drinking vessels to being found in relatively lower quantities by the end of the century.

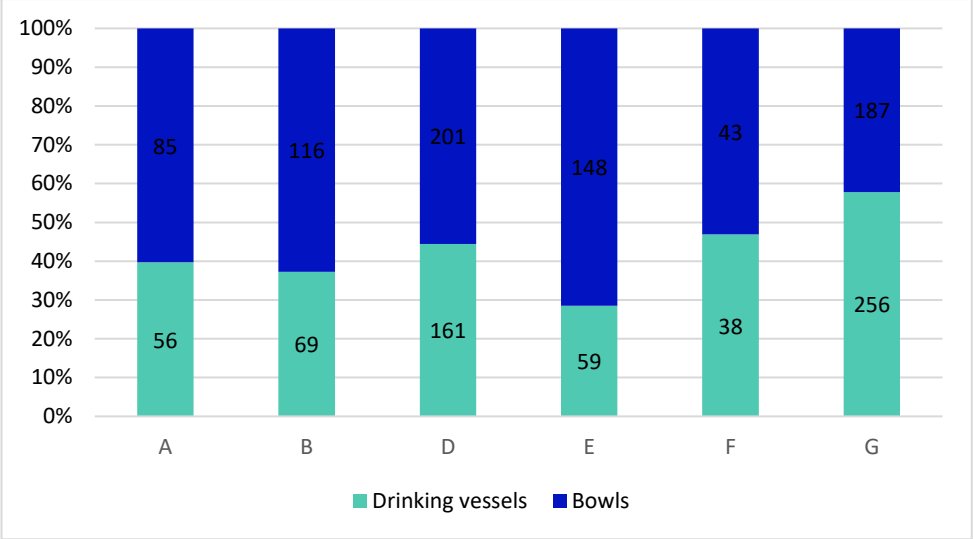


Fig.5.4 Proportions of drinking vessels and bowls across the dated bands with minimum vessel numbers (Band G has cups/bowls with fire rounded rims from Nijmegen deleted)

The decline in the use of non-blown techniques which was illustrated in figure 5.1 may have had some influence on this trend, as it is bowls and not drinking vessels that are the principal form produced by this method. This might imply that blown bowls such as tubular rimmed bowls (Isings form 44) were not being produced in such numbers as would replace the declining numbers of non-blown bowls, prompting the question as to whether the functions served by bowls were being provided by vessels in other material, notably ceramics. This possibility is discussed in the following section where the particular characteristics of selected individual forms will be examined in light of the general developments outlined here.

5.3.2 Drinking Vessels

The relationship between cups and beakers

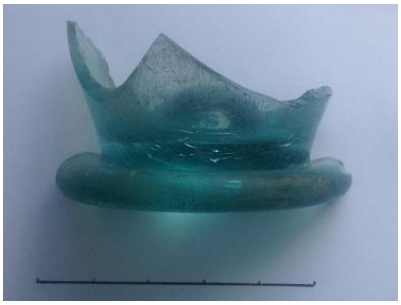
Cups and beakers never form less than 15% of the total recognised tableware forms in each band and are usually around the 25-35% mark (Fig.5.3). This section will look at the occurrence of the most common types, before discussing whether there is a changing preference over time for one form over the other. Amongst the most common types in the mid-1st century are blown drinking cups with cracked off and ground rims, decorated with horizontal wheel-cut and abraded lines. There are several shared characteristics that lead specialists to group these cups together for discussion, often using the Isings classification

(form 12) or, particularly in Britain, the name ‘Hofheim’ cup. Though there are a number of slight variations in form and finishing, they are also treated here as a single, albeit quite widely defined, category, as listed in Chapter 2.6.5 (no.1).

These cups will be discussed alongside a group of taller wheel-cut beakers (Isings form 34), with which they share some characteristics (Chapter 2.6.5 no.2), particularly a distinctive style of wheel-cutting. This horizontal cutting consists of broad bands, often flanked by narrow lines (Fig.5.5 a and c). They are often placed just below the rim, as well as further down on the body of the vessel. Other narrower wheel-cut and abraded lines also occur on both forms, but this wide cutting, often with a shallow scooped edge, is a familiar distinguishing feature of both forms.

Other aspects of vessel finishing between the cups and beakers are rather different. The beaker rims tend to be curved (Fig.5.5.a) whilst the cups usually have a straight rim (Fig.5.5.c and d), though curved rims also occur. The beakers also usually have a thick solid base, flattened underneath (Fig.5.5.b) whilst the cups have a flattened or concave base (Fig.5.5.d).


a


b


c


d

Fig.5.5 a. Beaker rims, Eysses b. Beaker base, Cremona c. Cup, Cremona d. Cup, Sheepen, Colchester

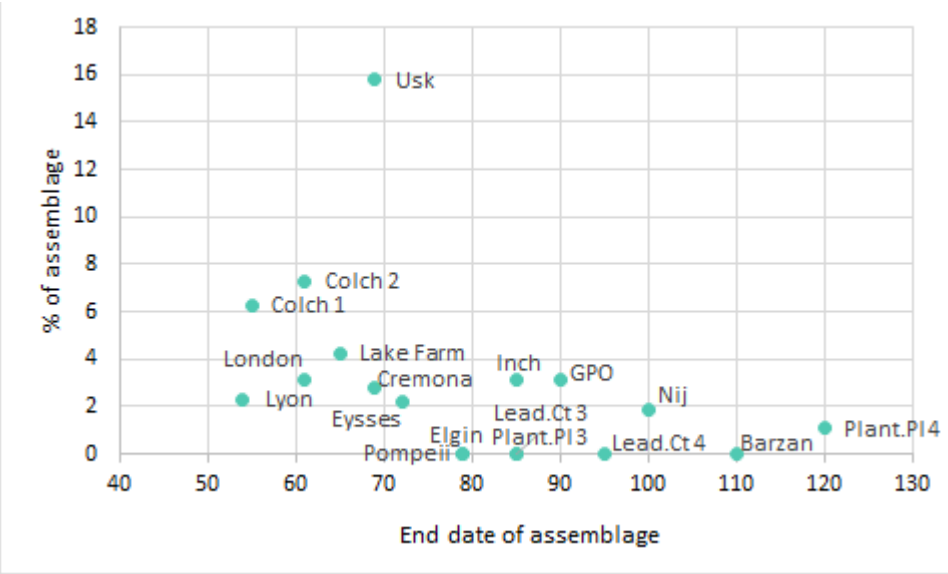


Fig.5.6 Wheel-cut cups as a proportion of tablewares on fully quantified sites, (% of minimum vessels)

The rate at which wheel-cut cups occur in the selected dated groups, plotted in Fig.5.6, shows a steady decline in their frequency. The vessels are particularly common at Usk, where identified fragments form 16% of the tableware assemblage. Usk is rather an outlier in the general trend which sees the cups declining from around 5% of the assemblages in the Claudian and Neronian period, to 0-3% from the A.D.70s onwards. The fact that there are no examples in the large group from Pompeii is particularly informative and suggests that their popularity had severely declined by A.D.79. The relatively high proportion from Inchtuthil is a little misleading, as there is only one example here, in a small assemblage. Nevertheless, the fact that one of these cups occurred on a site unoccupied until the early A.D.80s does indicate that some at least were still in circulation at this point. However, the turnover of new glass in an army unit at the furthest end of the chain of supply should be borne in mind.

The chronology of the wheel-cut beakers is more difficult to assess as they are less common and not as visible within the assemblages. Small body fragments of these beakers can be difficult to distinguish from wheel-cut cups, but the general consensus is that the cups were always much more common than the beakers (Cool and Price 1995, 68). Their solid bases are however quite distinctive, and when plotted using the same dated groups their occurrence shows some similarities with the pattern seen for the cups,

though only on two sites do they form more than 2% of the tableware assemblage (Fig.5.7). Again, they do not occur in the groups from Pompeii and further support for their decline in use after the early A.D.70s is provided by their absence from the Flavian sites in Scotland.

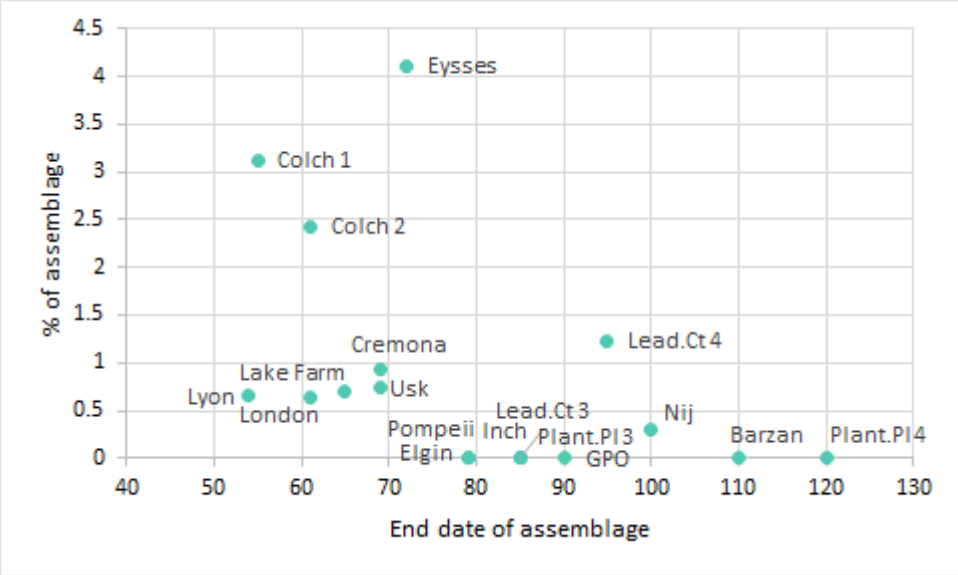


Fig.5.7 Numbers of wheel-cut beakers as a proportion of tablewares on fully quantified sites (minimum numbers calculated from base fragments).

Wheel-cut beakers are most popular in the Claudian and Neronian periods. This particular form therefore seems to have a very different chronological pattern compared to other 1st century beaker forms such as mould-blown beakers (Chapter 2 2.6.4.no.2; Isings form 31), wheel-cut beakers with a tubular base (Chapter 2 2.6.no.3), indented beakers (Chapter 2 2.6.5.no.5; Isings form 32 and 35) and arcaded and trailed beakers (Chapter 2 2.6.no.6) which are more numerous from the Flavian period onwards (Table 5.3)

Band	A	B	C	D	E	F	G
Total fragments in band	772	479	455	2293	1458	497	2839
Mould-blown beaker	0	0	0	9-10	8	0	31-2
Wheel-cut beaker with tubular base	0	0	0	1	3	?1	0
Indented beaker	0	3	0	5-9	11	1	89
Arcaded/trailed beakers	0	0	0	10	1	1	8

Table 5.3 Occurrence of some common beaker forms across each band (minimum numbers of vessels)

Not only does there seem to be a greater diversity of beaker forms in the final quarter of the 1st century, but a straightforward comparison between the numbers of cups and beakers of all forms on the fully quantified sites, seems to indicate a slight overall shift in preference from cups to beakers over the second half of the 1st century (Fig.5.8).

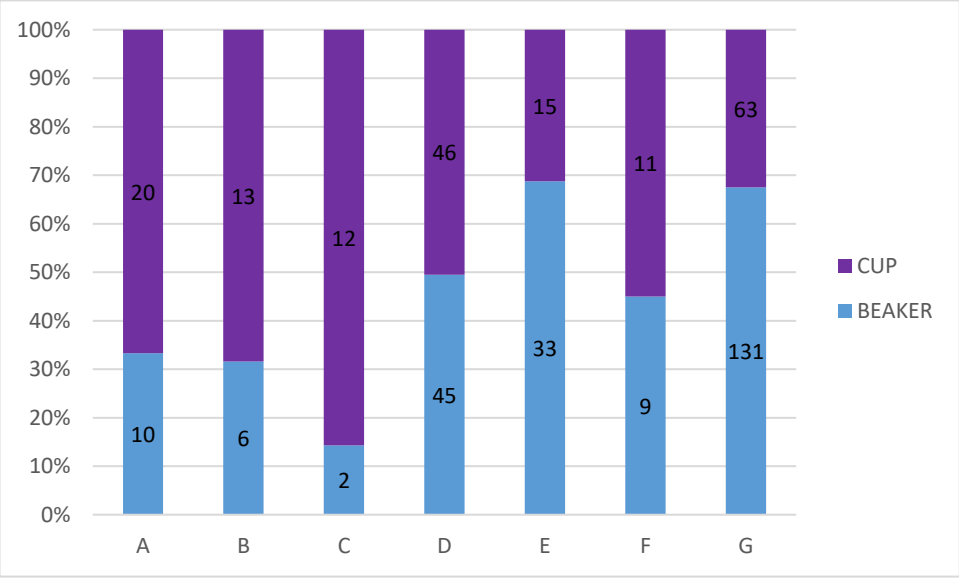


Fig.5.8 Relative numbers of cups and beakers from recognised forms

The data from Pompeii for example, where full profiles can be accurately recorded, suggest that here at least the beaker form is twice as popular as the cup (Fig.5.9).

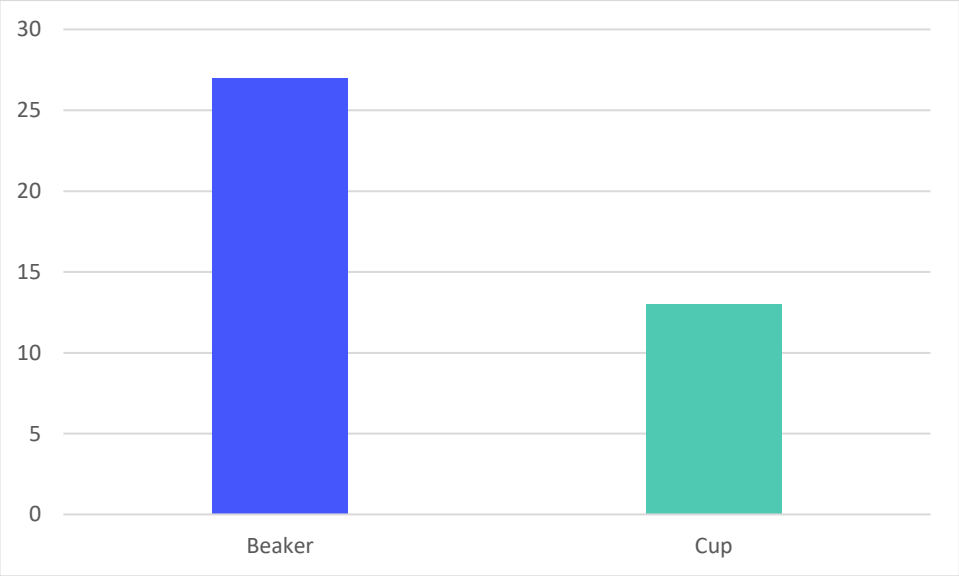


Fig.5.9 Numbers of beakers and cups in the Pompeii assemblage

As a general observation therefore, it could be proposed that the essential beaker form – a tall and narrow vessel – develops and diversifies during the second half of the 1st century whilst during the same period there is a move away from the shorter cups. The diminishing occurrence of mould-blown cups also supports this suggestion. Sports cups for example are relatively more common in the period c.A.D.40-60 (bands A-C), than in later contexts, whereas the mould-blown beaker form seems to appear slightly later. A further development in style is the appearance of small tubular bases which first appear on cups and beakers in band D and become increasingly popular through the later decades of the 1st century into the early 2nd century. These distinctive bases (Fig.5.10.a and b), consistently measuring around 40mm in diameter and with a narrow tubular edge and dome centre were used on a wide variety of beakers (indented, trailed, arcaded) as well as late 1st-2nd century colourless wheel-cut cups. One of the earliest examples of this base form occurs on the greenish colourless beaker from Usk (Fig.4.5.23.c), a vessel described as representing 'part of the changeover from low cups to taller beakers' (Price 1995, 160). The appearance of these bases is part of an increasing trend towards small defined base rings, also seen in the ground-out bases of relief and facet-cut cups and beakers (Fig.5.10.c).

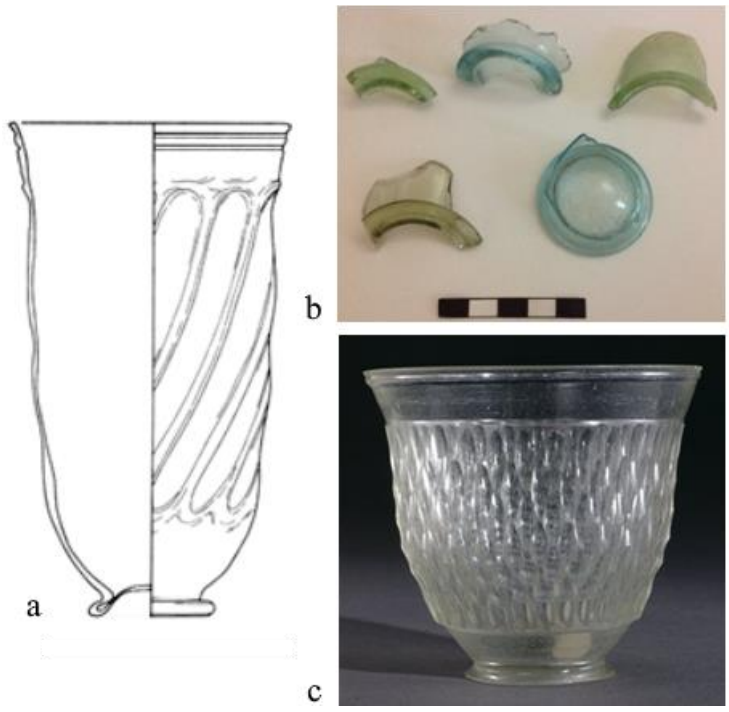


Fig.5.10 Small bases from cups and beakers, a.Wroxeter (Drawing © Y. Beadnell) b.Eysses c.Facet-cut cup from Barnwell, Cambridgeshire (© British Museum)

Whilst some cup forms may become much less common after the Neronian period, cups do not completely disappear. The late use of a wheel-cut cup of Isings form 12 is demonstrated by the three vessels from the gutter of the forum colonnade at Wroxeter (band G). Given their state of preservation it is thought that the three vessels were discarded intact, and are therefore likely to have been in use just before being deposited. The fact that a wheel-cut cup of Isings form 12 appears to have been in contemporary use with colourless beakers shows that in this instance at least, very different styles of tablewares co-existed.

Further evidence of the continuing popularity of the cup form is shown at Nijmegen where there are significant numbers of vessels with fire rounded rims with diameters of around 70-80mm and body profiles indicative of cups rather than beakers (for example Isings 1980, 309-310, Fig.17 nos.4-7, 9, 13, 20-22). The last years of the 1st century also see the introduction of a type of colourless or greenish/colourless cup with a straight sided body, a strong change of angle in the lower body and a small tubular base ring, usually colourless and decorated with horizontal wheel-cutting (e.g. Barzan, Chapter 4.8 band G, Fig.4.8.10 d and e). As well as the Barzan cups there are possible examples from the Flavian fort at Strageath in band F and Wroxeter and Nijmegen in band G. However, none of these forms achieves the equivalent reach or numbers of the earlier wheel-cut cups of Isings form 12.

The introduction of cups and beakers with facet cutting and high relief decoration.

Colourless drinking vessels with complex external cutting are one of the most visible forms introduced in the mid-late 1st century A.D (Oliver 1984; von Saldern 1991). The group as defined here brings together vessels decorated in several styles, but with a number of distinct recurring features:

- They are produced in good quality colourless glass
- They are blown
- They are usually straight sided conical vessels
- They usually have a small base with a slightly diagonal base ring ground out from the blown blank
- They frequently have raised cordons at or just below the rim that have been ground from the exterior surface

- They have a zone or zones of complex cut decoration covering most of the body

The decorative styles fall into three principal categories:

1. Those with regular or jigsaw facet cutting (sometimes combined with other features such as indents).
2. Those with raised geometric motifs such as ovals and bosses.
3. Those with freestyle raised designs such as leaf scrolls or depictions of monuments or figures.

Only fragments from the first two of these categories have been positively identified at the sites included in this study. This group is a key indicator of one of the major developments in glass technology and vessel style in the 1st century, the introduction of colourless vessels. Monochrome colourless vessels are very rare before this point, but begin to occur in small quantities during the second half of the 1st century A.D. These beakers are the first form to occur regularly in colourless glass (see Cool and Price 1995, 71-76).

The glossy interior surface indicates that they were initially blown. Once cooled they were processed by cutting and polishing the entire exterior surface. The rim was vertical and bordered with raised cordons or grooves. Visible grinding and polishing marks on the lower body and base provide strong evidence that the base rings were also ground out from the blank. (see Oliver 1984 and Cool and Price 1995, 71-76 for detailed descriptions of these techniques).

The most common type of cut decoration consists of short vertical oval facets set side by side, and there are seven examples from the assemblages here. Very frequently multiple rows of overlapping oval facets, forming a lattice of hexagons in a decorative zone, cover most of the body of the vessel (Fig.8.2.d). Other styles of facet-cutting, and facets in combination with other types of decoration also occur. Vessels on which individual facets have been merged into each other to form an irregular ‘jigsaw’ effect were found at Leadenhall Court, London (Fig.8.2.d) Eysses (Fig.8.2.g), and Nijmegen and beakers from

Xanten and Leadenhall Court, London have facets in combination with indents (Fig.8.2.b and e)

One system of classification for these facet-cut vessels was devised by Andrew Oliver in which they were divided according to whether the decorative zone stood proud of the surface of the vessel (Oliver 1984). This system is however largely redundant for the fragments recorded here, as they are generally very small. A further division can be made on the basis of profile, as some of the vessels can be defined as beakers, whilst others are shorter in relation to their rim diameter. Again, many of the fragments here are too small for this distinction to be made. It is possible that other contemporary vessel forms decorated with facet cutting (see for example an ovoid jug in the British Museum (Harden 1987 193 no.103) and a spoon from Fishbourne (Harden and Price 1971, 336 no.31 Fig.138 pl.XXVI)), might be represented here, but conical drinking vessels are the form most frequently decorated in this fashion and the likelihood that the fragments belong to these other rare items is very low.

Closely related to facet-cut drinking vessels are beakers with ground exterior surfaces leaving decorative motifs in high relief. This type of decoration is less frequently seen and in this group there are five such vessels; a fragment from Eysses has a small rosette ground from the surface (Fig.4.5.16.b and 8.2.f), large ovals are on vessels from Nijmegen and Plantation Place, London (Fig.4.8.8.b and Fig.4.6.16.b), and Nijmegen also produced a fragment with a raised comma-shaped motif (Isings 1980, 294-5 nos.24-5).

The combination of water-clear colourless glass and intricate, labour-intensive decoration and their relative rarity are indicators that these vessels were high-status items. The type is very easily identified even from very small fragments and so the likelihood of under-representation is very low. The information from the data in Chapter 4 gives a clear picture of their chronology (Table 5.4).

	Band D	Band E	Band F	Band G
Oval/hexagonal facets	1		4	2
'Jigsaw' facets	1	2	1	1
Facets and indents	1		1	
Motifs in high relief	1	1		3
Raised cordons	1			

Table 5.4 Vessels with facet-cut decoration by dated band

Their earliest occurrence in the assemblages in this study comes in band D (c.A.D.60 and c.A.D.70). One of these early examples, the beaker from Xanten, provides a particularly close date for the type being in use, as it comes from a destruction layer at the fortress relating to the Batavian revolt of A.D.69 (Hanel 1995, E131 taf.154). The other fragments come from Usk in south Wales and Eysses in south west France. Although the data-set here is small, it does reveal that 'jigsaw' facets and facets in combination with indents occur early in the production period. A complete conical beaker with 'jigsaw' facets found at Pompeii and now in the National Archaeological Museum at Naples also supports an early date for the introduction of this variety of facet cutting (Harden 1987, 192 no.102).

Whilst the examples noted here are not quantified in relation to the sample size, the fact that they only reach 3-6 examples in any of the bands suggest that they were not one of the common forms and argues against any particular peak in use during the second half of the 1st century. It seems that with occasional exceptions, as at Fishbourne where there are five facet-cut drinking vessels (Harden and Price 1971, 342-4 nos.39-44 Fig.138-9 pl.XXVI - XXVII), they are not found in large numbers on any site of this period. Nevertheless, they appear to have had a very significant presence in terms of distribution, often appearing as single vessels in later 1st century and early 2nd century assemblages, not just at high status sites such as Fishbourne, but also at seemly more commonplace settlements. A suggestion that the distribution of these vessels coincided with military installations was discussed in connection with the vessels found at Colchester (Cool and Price 1995, 73) but is difficult to confirm, as so many 1st century A.D. sites have military associations at one point or another.

Larger drinking and serving vessels

Certain large high quality tablewares, often featuring handles, are difficult to classify and could be interpreted as serving a number of functions. In this category can be placed blown and non-blown vessels with a stepped rim, deep convex body and a stemmed foot, with large curving handles (cantharus) or with no handles (goblet or crater), blown deep bodied vessels, again often with a stepped rim, and a single handle (modiolus) and blown and non-blown bowls with two looped handles (scyphus). Often imitating forms in other materials, they appear too large to be considered for individual drinking, but can perhaps be best considered as presentation vessels, perhaps centre pieces. Similar forms can sometimes be identified in contemporary wall paintings, where they are seen containing fruit and liquids (Naumann-Steckner 1991, Pl.XX a, XXII a and XXIV b).

The presence of these types in the dated bands in Table 5.5 shows that they occur in small numbers in assemblages throughout the second half of the 1st century.

	A	B	C	D	E	F	G
Total fragments in band	772	479	455	2293	1458	497	2839
Cantharus/crater	2-4	4-7	1-2	4	4	1-3	0
Modiolus	?2	?2	0	?1	4	?1	?1
Blown scyphus	1	1	0	2-3	0	0	0
Non-blown scyphus	1	0	0	3	2	1	1

Table 5.5 Large ‘presentation’ vessels by dated band

The scyphus form occurs more frequently in non-blown glass from the Flavian period onwards, particularly in colourless glass, whilst the blown scyphus appears to be an earlier form and has not been identified at the Flavian and later sites here. This trend seems to be in contradiction to the decline of non-blown glass noted earlier (Section 5.2.1). Scyphi are also one of the very few forms where colourless glass was used for an existing form (see below Chapter 8.5.1). These forms are only found here in very small numbers and are often not firmly identifiable from small fragments. A fuller understanding of their chronology requires a larger data-set which also incorporates vessels with full profiles.

5.3.3 Bowls and Plates

The non-blown ribbed bowl (Isings 1957 form 3) is the most common recognised bowl form throughout the second half of the 1st century A.D. in this data-set. These bowls were produced in various shapes and styles, but the overall characteristics remain remarkably similar through the entire production period. Figure 5.11 shows the relative quantities of ribbed bowls compared with all other non-blown forms in each of the bands. Ribbed bowls are always more numerous than all other non-blown forms combined. As a group, the other forms decline from the A.D.40s through to around A.D.70. with ribbed bowls forming an increasingly higher proportion of the assemblage. This trend is reversed in band E, but again one site, Pompeii, is responsible for this pattern. Of the 24 non-blown vessels from the total group of 947 items from Pompeii, only five are ribbed bowls. This quantity is surprisingly low when compared with the other much smaller assemblages in the same band. The group of 244 fragments from Carlisle for example includes a minimum of six ribbed bowls represented by 11 fragments. There seems no obvious reason for the relative lack of the form at Pompeii. Other non-blown forms, including those usually associated with early-mid 1st century production such as 'fineware' types (such as Isings form 2 and 22) and *pyxides*, occur in the Pompeii assemblage, which might rule out a chronological explanation. Other reasons might include regional workshop preferences, or a partiality amongst the military for sturdier forms, as suggested by Prior (2015, 315).

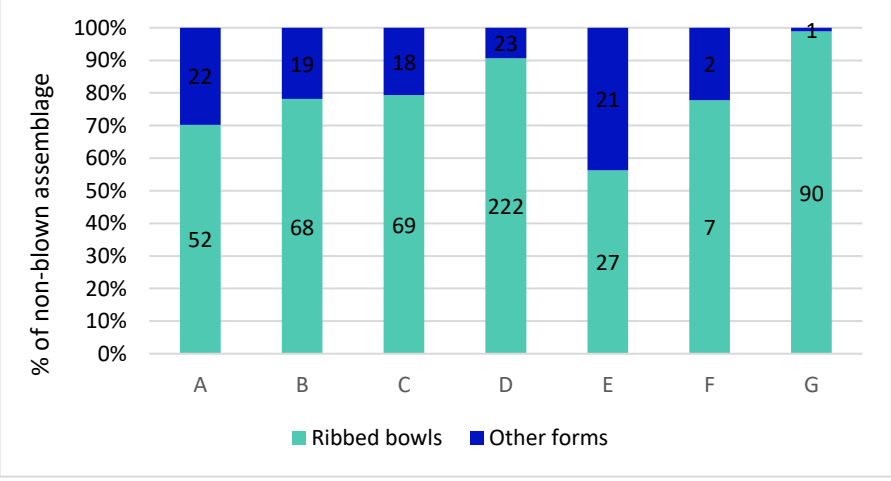


Fig. 5.11 Relative quantities of ribbed bowls compared with other non-blown bowl forms (with minimum number of vessels)

It has frequently been noted that ribbed bowls are both sturdy and easily recognisable from fragments, perhaps accounting for the high prevalence of the type and for their continued presence beyond the period when other non-blown forms disappear from the archaeological record (Foy and Nenna 2001, 170; Cool and Price 1995, 15). At Vindonissa, Berger noted also that ribbed bowls in later contexts tended to be more poorly finished, which would suggest that they were at least still being manufactured, if to a poorer quality (Berger 1960, 18). The discovery of eight bowls at Herculaneum still in their packing material in a *taberna* near the forum might also suggest that they were being produced in the late A.D.70s, though it is not possible to say whether these particular bowls were newly manufactured vessels or 'second-hand' items, re-packed for transportation (de Franciscis 1963, Fig.2 nos.1-2; Scatozza-Höricht 1986, 27 nos.3-10, tav.11-12).

Another type of non-blown bowl or plate, usually produced in colourless glass but occasionally known in strong colours occurs in the later 1st century and 2nd centuries A.D (Price and Cottam 1998, 55-59). Although they can be made with slightly different profiles and in various sizes, these vessels have often been grouped together because they have some similar features, particularly in the rim and base. The rims are out-turned, often rather wide (c.10mm) and sometimes have a distinctive overhanging edge. The straight body can be shallow or deep and tapers in to a flat base and a high base ring (Fig.5.12 and Chapter 2 Fig.2.11.9). Colourless examples can be decorated with facet-cutting or more rarely figured-cutting (and very occasionally this has been noted on strongly coloured vessels). The diameters vary widely, from small bowls and plates no more than 100mm wide to large shallow vessels up to around 350mm.

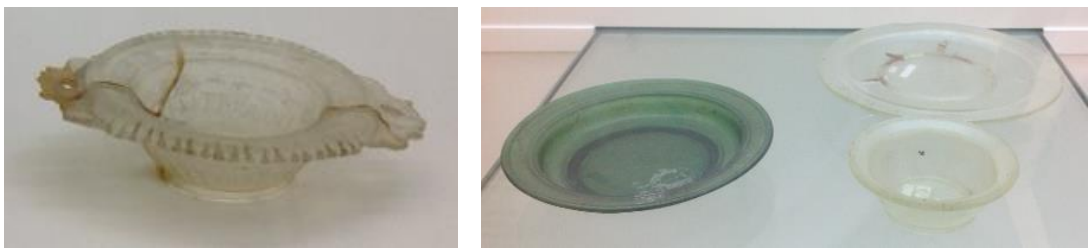


Fig.5.12 Wide-rimmed non-blown bowls, Museum of Ancient Glass, Zadar, Croatia

The group was described by Grose as 'international' in style, occurring across the empire, from the near east to Scotland (Grose 1991, 12-18). The variations in profile are discussed

by Grose and also in association with finds from Colchester (Cool and Price 1995, 37-8, nos.212-225 Fig.2.11). The fact that these vessels are mostly produced in good quality colourless glass and that they can be decorated with facets strongly points to a Flavian or later date for their production, though the exact point at which they begin to be produced is unclear. At Fishbourne, they appear to occur in late 1st century contexts, though the dating information in the publication is slightly contradictory (Harden and Price 1971, 331-2, 334-5 nos.25-6, 33-4 figs.137-8 pl.XXVI; the context of no.26 differs in the text and catalogue). David Grose's assessment on the basis of dated finds was that the group 'emerged towards the close of the first century'. They are certainly very uncommon in this data-set. A possible early example comes from Cremona (Fig.4.5.2 f) and another came from a midden deposit dated A.D.95-100 at Leadenhall Court in London.

The most common recognised blown bowl form is the tubular rimmed bowl (Isings form 44/45) which was produced throughout the second half of the 1st century. It is usually identified by the distinctive folded rim, although fragments with an applied base ring and carinated lower body can be connected to the form with a fair degree of certainty. Unlike ribbed bowls, body fragments are not distinctive, so a comparison of the number of rim fragments (equally distinctive in both types) in the larger assemblages can be useful. On this basis, both Italian sites, Cremona and Pompeii, have a greater number of tubular rimmed bowls than ribbed bowls, by a considerable degree at Pompeii (43 to 4) and to a slightly lesser extent in the earlier Cremona assemblage (36 to 23). At Eysses the numbers are closer, with 9 ribbed bowls to 7 tubular rimmed bowls. At other sites however, particularly in Britain, non-blown ribbed bowls are the dominant bowl form throughout the period. In period 2-3a contexts in Carlisle (A.D.73-c.83/4) for example, there were 11 ribbed bowl rim fragments but no tubular rimmed bowl rims; at Elginhaugh (late A.D.70s-80s) ribbed bowl rims outnumber tubular rimmed bowl rims by 6:1; in period 4 at Plantation Place in London, rim fragments from ribbed bowls outnumber those of tubular rimmed bowls by 9:1; in period 2 and 5 at Leadenhall Court, London (c.A.D.65-70/5 and c.A.D.95-100) all bowls are non-blown.

Whilst the overall impression is that the bowl form is sustained to a large extent by the continued presence of the ribbed bowl throughout the second half of the 1st century, the case of Pompeii acts as a reminder that assemblages of fragments may not be providing the full picture. There is much more variety in the blown bowl forms from Pompeii than

has been recognised at other sites (Fig.5.13), suggesting that some forms may not register under more normal processes of breakage, deposition and taphonomy, where perhaps large (and distinctive) rim and base fragments are recovered for recycling. Even at Pompeii however, there is only one blown bowl described as colourless. Colourless glass appears to have been used to produce blown bowls on only very rare occasions in the 1st century, though it is regularly employed for a number of bowl forms in the 2nd and 3rd century (Price and Cottam 1998, 97-99, 106-110).

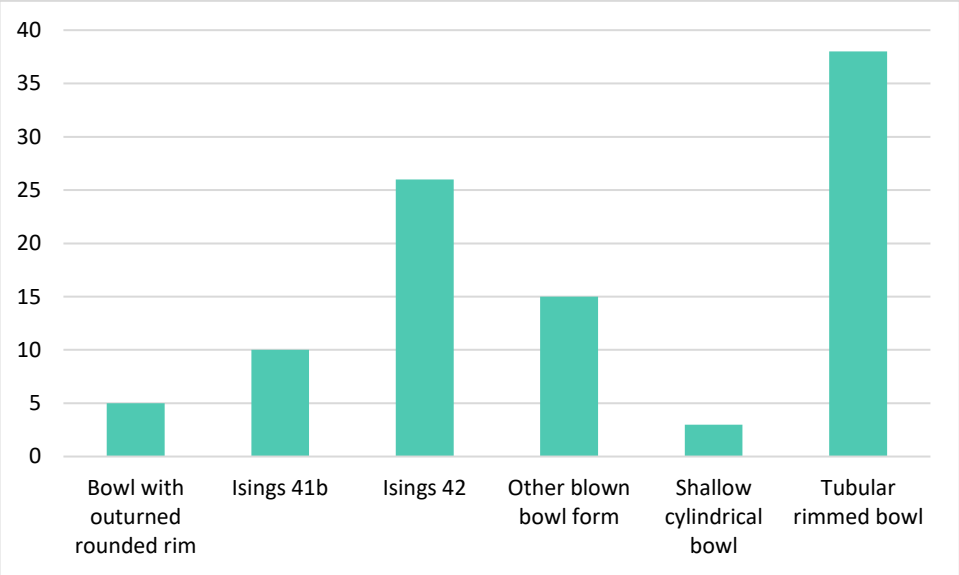


Fig.5.13 Blown bowl forms from Pompeii

The picture is not clear cut and as well as chronological and regional factors to consider in the production and supply of bowls, there is also the relationship between the glass forms and those in other materials, particularly ceramics. Bowls and what samian specialists term dishes far outnumber other forms produced in samian for example, and these ceramic vessels may have served the role of bowl at table.

5.3.4 Jugs

In any assemblage jugs are identified on the basis of rim, neck and particularly handle fragments. Body fragments are often indistinguishable from those of other vessels, unless a substantial area survives, and base fragments are easily confused with those of bowls and particularly jars, such as collar rimmed jars of Isings form 67. In the 1st century A.D. the most common type of rim used on jugs (for example on Isings form 52b, 55) is a

circular horizontal folded rim where the end of a cylindrical neck is bent out, up, in and then flattened. Horizontal folded rims and cylindrical necks are also used on bottles and on some flasks, and so the full vessel form is often unclear from small fragments.

Confusion over identification of jugs from fragments may mean that they are under-represented when quantifying assemblages. However, these issues are likely to be similar at all periods and a chronological comparison can legitimately be made. The proportions of tableware forms within each band shown in figure 5.9 however do not show a clear trend in the occurrence of the jug form. They are always less common than drinking vessels and bowls, except in band F where the ratio between drinking vessels and jugs is almost equal and jugs are at their most common compared with other tableware forms. If jugs are considered a more communal form than drinking vessels – and it is a reasonable assumption to suggest that these relatively large serving vessels were intended to supply the needs of more than one person at table, then a ratio in favour of cups and beakers might be expected. The situation in band F is therefore a little curious.

Jugs were produced in strong colours and most commonly in blue/green glass. Colourless examples are in contrast almost completely absent in these assemblages. A colourless handle fragment, perhaps from a jug, came from a pre-Boudican context at Colchester and was considered so unusual at this early date that the possibility that the context was insecure was not ruled out in the specialist report (Cool and Price 1995, 140-1 no.1025 Fig.8.8). This disinclination to use colourless glass for the production of jugs, similar to that noted earlier for blown bowls, is curious and will be explored in Chapter 8.3.1.

As well as an absence of colourless jugs in the 1st century there is also little evidence for cut decoration on any of the jugs, whatever their colour, in the assemblages here. All the decoration was added whilst the decoration is hot, either as polychrome splashes, particularly in the early groups, or vertical and diagonal ribs.

	A	B	C	D	E	F	G
Total fragments in band	772	479	455	2293	1458	497	2839
Conical jug	1	4	4-5	10	3	16	33+
Globular jug		1	?4	7	1	5-6	3
Spouted jug		2		1	4	3-4	19
Amphorisk		8-12	5-10	?2	2		
Short necked globular jug					5		
Biconical/ovoid jug					11		

Table 5.6 Jug forms by dated band

Band E shows a wider variety of jug forms than in any other band (Table 5.6). This is entirely a result of the forms recognised at Pompeii, and it might be expected that a site that produced intact vessels might include forms that elsewhere might go unrecognised. The two handled amphorisk shows a particular peak in use in band B, with correspondingly high numbers in the broader band C that cover both the Claudian-early Neronian period. Jugs with pouring spouts appear first in later Claudian/Neronian assemblages, but only occur in small numbers except at Nijmegen in band G.

The two principal long-necked forms, conical and globular jugs, occur from the Neronian period onwards and are present in every band through to the early 2nd century. A single handle and body fragment, described as a conical jug, was noted in a Claudian context at Colchester (Cool and Price 1995, 124 no.925 Fig.8.6) though this seems to have a curved handle rather than the angular handle more typical of the form. Conical jugs are the most frequently recognised single handled form across all bands, though their straight sided body fragments are more readily identified than the convex body fragments of globular jugs. Conical and globular jugs (Isings forms 52b; Fig.2.11.31 and Isings form 55; Fig.2.11.30) have many characteristics in common, both having a folded rim, long cylindrical neck and an angular ribbon handle, often with a prominent central rib. They are produced in the same range of colours and have very similar styles of decoration, all of which suggest a close link between the forms at the point of production.

No long-necked globular jugs occurred in the Pompeii assemblage and the only long-necked conical jug is a more unusual form with a tubular base ring. The forms were also

absent from Cremona and Eysses in south-France, both in band D, though they do occur in the Rhineland and British sites in that band. The relative scarcity of these long-necked jugs at Pompeii and elsewhere in southern Europe compared to their popularity in the north-western provinces was noted as early as the 1930s, when Thorpe described them as illustrating 'early northern line' and as being the work of 'Seine-Rhine' glassworkers (Thorpe 1935, 25-29). The group, along with globular collar rimmed jars, was identified by Jennifer Price as the earliest vessel forms not regularly seen south of Alps, and she noted that the form was not present at Vindonissa, nor at that time found in museum collections in the Rhône valley south of Lyon (Price 1978, 74). A distribution pattern focussing on 'the Rhineland and the areas now occupied by northern France and Belgium' and was also noted in connection with the considerable quantities found at Colchester (Cool and Price 1995, 123).

Whilst these long-necked jug forms appear to be less common in Italy, it is more difficult to establish the prevalence further north of the other jug varieties seen intact at Pompeii. Many of the jug forms from Pompeii have rims that are more difficult to identify as jugs from small fragments. These wider rims with rolled in or rounded edges are also used on other forms, particularly jars and so perhaps therefore these varieties are simply not being recognised elsewhere.

5.3.5 Jars

Jars occur throughout the study period, though never in large quantities. They are most frequent in Band E, and perhaps show an overall slight increase from the A.D.60s onwards, though the numbers are too small to draw any firm conclusions. There is huge variation in the size, shape and finishing of the vessels defined as jars (2.6.1). This diversity puts some limits on the interpretation of the data as the group cannot be considered as have a unified function (unlike for example drinking vessels).

Jars are often not immediately identifiable from small fragments, as rims can be indistinguishable from those of other forms such as small bowls and body and base fragments can be interchangeable with jugs and some bowl forms. This is why there is a much greater variety in specific jar forms in band E (Table 5.7), a result of the complete forms identified in the Pompeii assemblage.

	A	B	C	D	E	F	G
Total fragments in band	772	479	455	2293	1458	497	2839
Collar rim jar	1	4	3	21	6-7	4	42
Ovoid/globular jar		1			15		
Square jar					39		
Ointment jar					5		11

Table 5.7 Jar forms by dated band

Jars with collar rims (Fig.2.11.36) are the most consistent form throughout the second half of the 1st century, though there are some slight differences in profile between vessels, with some having a simple concave base and others having an open pushed-in base ring, similar to those seen on globular jugs. These latter jars were produced in the same range of colours as globular jugs and often have similar ribbed decoration. These vessels share so many characteristics that a common production location or locations is a strong possibility, including perhaps, as Price has argued, workshops in the north-western provinces.

5.3.6 Bottles, Flasks and Unguent Bottles

Information on three forms of bottle (cylindrical, square and hexagonal) has been collected as well as overall data on bottle numbers. Quantification of bottles is complicated because minimum numbers can be unreliable as a measure of true presence if based upon rim and handle preservation alone. Fragments from these parts of the vessel, usually solid and substantial, are more likely to have been collected for recycling and therefore absent from the archaeological record. Hexagonal bottles may also be underestimated in assemblages as most body fragments are undistinguishable from square bottle fragments. A cautious examination of the data does however reveal some trends in bottle use from the mid-1st century through to the beginning of the 2nd century.

Bottles represent a small share of glass vessel assemblages in the earliest decades of this study, but grow rapidly in importance through the later 1st century, dominating later groups. Fig.5.14 illustrates this trend, with bottles forming only 4-12% of the vessel assemblages from contexts dating to the period A.D.40-60 (bands A-C), with a noticeable

jump in numbers from the A.D.60s onwards to reach nearly 50% of fragments discarded in the late A.D.70s-80s (band F).

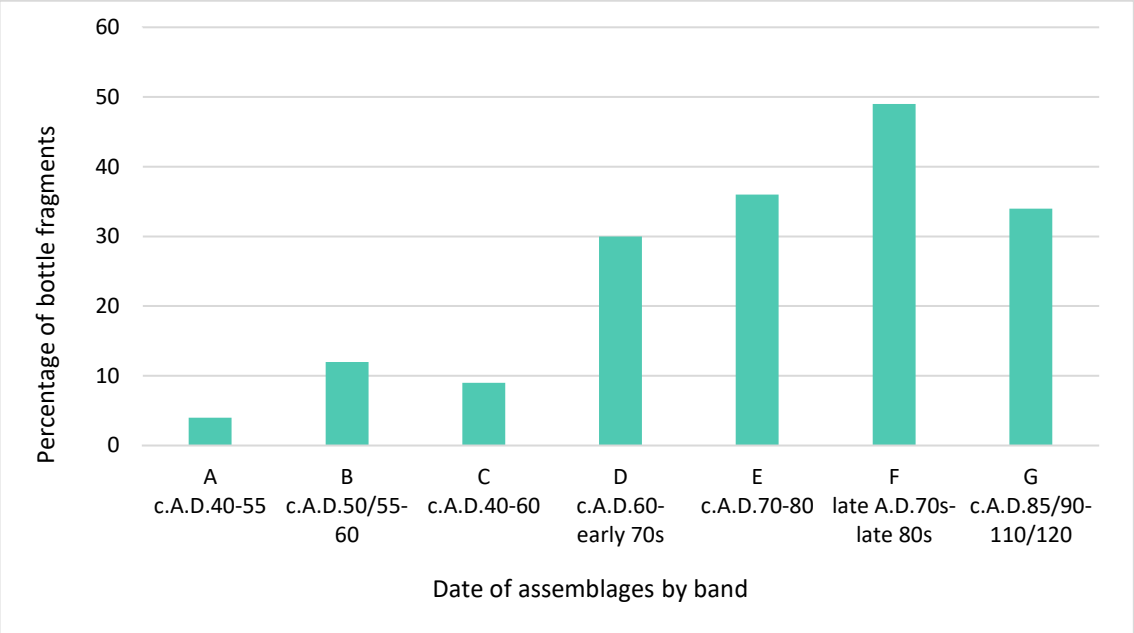


Fig.5.14 Proportion of bottle glass in quantified assemblages

In the earliest bands (A-C) bottles are scarce, being absent from even some of the larger assemblages, such as Lyon. Some assemblages from early military sites also lack bottles, such as Waddon Hill, Brandon Camp and Cadbury Castle. Bottles are however found at many of the earliest London sites, perhaps reflecting the commercial character of the settlement, where supplies would have been stored and exchanged.

The increase in bottles occurs across all types of site but is particularly notable on military forts. From being sparse or absent in bands A-C, military use of bottles grows through the period A.D.60-85, contributing to the peak in bottle usage seen in band F. In the three largest Scottish Flavian assemblages, Camelon, Elginhaugh and Inchtuthil (band F), cylindrical and square bottles were found in roughly equal numbers, though at Camelon additional cylindrical bottle fragments came from Antonine contexts, though are most likely to derive from 1st century activity at the site. Flasks and unguent bottles are present in all bands (Table 5.8), though again with much greater frequency in band E, being found in particularly high quantities in the Pompeii assemblage. The two groups are discussed together here as there is considerable overlap between them (2.6.1).

	A	B	C	D	E	F	G
Total fragments in band	772	479	455	2293	1458	497	2839
Bath flask				5	4	3	23
Ovoid flask /unguent bottle		3-4		3	238	1	
Piriform/globular unguent bottle				10	13		
Bird-shaped unguent flask					1		
Spherical unguent bottle	1				2		
Tubular unguent bottle	16	7-8	6	35-37	197	1	7
Conical unguent bottle		2-3		5-6	1	2-3	3

Table 5.8 Unguentaria forms by dated band

The overwhelming majority of these unguent bottles and flasks are simple undecorated blue/green vessels and it is interesting to note how relatively less common the more elaborate designs are, such as the thin-walled spherical containers (3 examples), the bird-shaped form (one example) and those in the shape of dates or pine cones (4 examples from Pompeii). The most persistent form is the tubular unguent bottle which is found in every dated band. Tubular unguent bottles are easily recognised from small fragments, which may push their numbers higher than other less visible forms.

The presence of such large numbers of flasks and unguent bottles at Pompeii has already been noted by a number of commentators (Beretta and di Pasquale 2004, 79 and 97; Fontaine 2009) and their function and contents have also been the subject of analysis (Scattoza Höricht 2012, 343-359). The explanation for the extraordinary high numbers of flasks, if not unguent bottles, at Pompeii is perhaps hinted at by the relatively low numbers of square and cylindrical bottles, suggesting liquids may have been stored and served in flasks in preference to bottles.

5.4 Conclusions

The data reviewed in this chapter covers many aspects of vessel form, from production technique through to general form groups and specific types. The clearest trends appear in the largest data groupings which concern method of manufacture (Section 5.2) and general form categories (Section 5.3.1). Within the smaller data groups, relating to specific vessel forms (Sections 5.3.2-6), the quality of the information that can be extracted from the data is more variable because of the much smaller numbers recorded.

The decline of non-blown glass over the second half of the 1st century A.D, along with the growth in blown vessels, corresponds with existing observations concerning the development of production techniques during this period. The data also supports an interpretation that sees non-blown technology become more centred upon a single form, the ribbed bowl, which continues in use to the end of the century. Nevertheless, although non-blown vessel manufacture declined both in turnover and in form variety, its persistence into the later 1st century and beyond is demonstrated by its adoption in the manufacture of new, colourless, forms such as scyphi and wide-rimmed bowls. It may be possible to interpret the use of labour-intensive production techniques in conjunction with relatively rare colourless glasses as a demonstration of the prestige value in these new forms, as was suggested for facet-cut beakers (5.3.2). The introduction of colourless glass and its relative status is examined further in chapters 6 and 8.

The data also emphasise the scarcity of mould-blown glass. This category has been intensely studied and has yielded rich information concerning production techniques and artistic development (see for example Price 1991a; Stern 1995; Fontaine-Hodiamont (ed) 2011), but nevertheless formed a very small proportion of the glass in daily use, peaking only at 5.5% of the total tableware assemblage in the decade A.D.50-60.

Trends in the rise and fall of general form categories were also clarified in the data, though close scrutiny of the speed of these changes was not possible for all groups. A key moment of increase in the use of bottles can be seen in the decade A.D.60-70, with further growth in the following two decades. It was noted that bottle use was high at sites associated with military activity and that some urban sites, particularly Pompeii, had lower bottle numbers, though others, such as Cremona, also had relatively high numbers of bottles

(over 20%). There may be several reasons for these differences. They may, perhaps, have been a greater need for sturdy, easily sealable vessels to transport liquid and semi-liquid supplies, such as oil, sauces, honey, etc. over longer distances to supply military personnel. At Pompeii the many square jars may have contained these sorts of products. A further consideration is the difference in quantification between Pompeii and other sites. There is no possibility of over-estimation of the bottle numbers at Pompeii, whereas at sites where only fragments are recovered, bottle numbers may be less accurately quantified.

Trends within specific forms are more difficult to establish with confidence, owing to the smaller data groups. Within drinking vessels, a shift away from the use of cups towards beakers is highlighted by a comparison of wheel-cut cups (Isings form 12) with mould-blown, indented and arcaded beakers (figs. 5.7 and 5.9). However, the corresponding decline of wheel-cut beakers with solid bases (Isings form 34) (Fig.5.8), suggests that a simple opposition of cup/beaker use is an inadequate description of the trend and that more complex explanations are needed. Wheel-cut cups and wheel-cut beakers with solid bases have close ties both in colour (strongly coloured and blue/green glasses are used) and decoration (combinations of horizontal wheel-cut lines and broader bands) and the decline of both may relate to new choices in colour and decoration rather than form alone. The decline of strong colours will be examined in further detail in Chapter 6.

The data also hinted at regional differences in form, with an increase in the occurrence of conical and globular jugs with extended cylindrical necks in the Rhineland and Britain from the A.D.60s, forms absent from more southern sites. The data at this point is not numerically strong enough to reveal clear individual chronological paths for these forms, but developments in the secondary workshops that may have impacted regional vessel design are discussed further in Chapter 7.

Chapter 6
Colour

6.1 Introduction

6.1.1 Colour in the Ancient World

The widespread use of strong colours is perhaps the most striking feature of early Imperial glass. Bright colours were frequently used either on their own, or in combination with other contrasting shades in a variety of polychrome designs. Diners in the mid-1st century A.D. would have been presented with glass cups, bowls, jars and jugs in an array of colours, alongside coloured ceramic finewares and enamelled metalwares. In Chapter 4 the occurrence of colour in assemblages from the mid to late 1st century was summarised, confirming that colour was a significant element of the vessel glass in this period. In several assemblages (including Lyon, Colchester and Pompeii) between ten and fourteen different colours of glass are documented. It is also important to remember that naturally coloured blue/green glass vessels are in themselves brightly coloured and though common, nevertheless contributed vivid colour to the dining experience.

There has been an increasing awareness in archaeological studies of the importance of colour in the ancient world, and of the need to think beyond the extant material remains, often drained of their original brilliance, to the living colours of the past. This is the case for example in the study of statuary, where new techniques of analysis have allowed the sometimes startling colour combinations employed on the original marble surface to be reconstructed (see for example the British Museum's Ancient Polychromy project and the Copenhagen Polychromy Network's 'Tracking Colour' Project[4]). This expanded understanding of the extent to which colour featured in the classical world has encouraged a wider interest in the topic, with a number of publications and conferences focussing on the reaction to colour in the ancient world. Glass, though often weathered, rarely suffers the degradation of colour seen in other materials, but despite its resilience it has not received particular attention in interdisciplinary studies of ancient colour. The international conference 'Colours in Antiquity' held at Edinburgh in 2001, brought

[4] www.britishmuseum.org/research/research_projects/all_current_projects/ancient_polychromy.aspx ; www.trackingcolour.com

together specialists working in a number of different areas to examine both the conservation of coloured artefacts, and the role of colour in the ancient world. The organisers saw the study of colour as touching upon all aspects of our appreciation of the past, providing a ‘valuable, though as yet relatively unbeaten, path of approach to our evidence' (Cleland and Stears eds. 2004, iv). Still, not a single contribution touched on the use of coloured glass. Glass is equally absent from a number of other reviews of historical colour. In the introduction to his survey of Roman colours, *Colour and Meaning in Ancient Rome* (2009), Bradley lists some of the most influential publications in the field. None of the works mentioned relate to the use of colour in Roman glass, nor does a discussion of glass fall within the scope of his own work. In part, this is because his and other studies focus on philological aspects of colour terminology used by ancient authors. Glass is not frequently discussed in Roman texts, and therefore has little to contribute to studies of that kind. Nevertheless, as a material that provided colour in abundance to daily life in the 1st century Roman world, glass cannot be side-lined.

6.1.2 Structure of the Chapter

In this chapter, each section will bring together the data relating to the occurrence of the main strong colours as well as colourless and polychrome glass, from the assemblages presented in Chapter 4. Where relevant, factors that might influence the trends displayed by the data, such as variations in the recovery, retention and quantification of fragments, are highlighted. It will be demonstrated that colour representation changes considerably in the second half of the 1st century and these changes will be compared across the range of colours in use. The behaviour of individual colour groups will be placed in context and questions regarding the manufacture and supply of coloured glass, as well as its relationship to vessel form will be addressed. Particular features of colourless glass vessels will be examined, and its growth in popularity will be assessed in relation to trends in both strongly coloured and blue/green glass. In the final section, this information will be drawn together to establish the main trends which will inform subsequent discussions concerning the development of the glass industry (Chapter 7) and in the context of wider changes in the mid-late 1st century Roman world (Chapter 8).

6.2. The Occurrence of Individual Colours

6.2.1 Introduction

Information concerning the prevalence of the major colours and colour groups is presented here using the information from the summaries of individual assemblages in Chapter 4. The scatter graphs mapping the occurrence of each monochrome colour and for polychrome glass at individual sites derive from assemblages that could be fully quantified and have a minimum number of items greater than 50 (3.9.2, Table 3.2). Other charts include data from all the featured sites as indicated. In all the assemblages, storage bottles and unguent bottles have been excluded from colour counts. Storage bottles are invariably blue/green, so add nothing to our understanding of colour change whilst potentially distorting the picture on sites where the bottle count is particularly high. Unguent bottles are nearly always blue/green, and the huge numbers found at Pompeii again distort the picture from that site in comparison to the other groups. Two further issues need to be considered when using this information. Firstly, as in the previous chapter there are inevitably differences in calculation of fragments and minimum vessel numbers between groups. Those with a greater number of items may give a more accurate impression of the frequency with which each colour occurs whilst smaller groups may over-emphasise the presence of certain colours because of circumstances governing the deposition and recovery of the fragments. Conversely, in smaller groups minimum vessel number is easier to quantify. Furthermore, the assemblages represent different patterns of disposal and varying periods of time during which the fragments were deposited. These problems were discussed in Chapter 3, and any significant factors governing the disposal of the glass were highlighted in the introduction to the discussion of each assemblage in Chapter 4.

6.2.2 Dark Blue

Dark blue is one of the most common of the strong colours used in Roman glassmaking, though in none of the assemblages does the colour account for more than 12% of the total tablewares. It was used to produce all the major categories of tableware in non-blown, mould-blown and blown glass and was occasionally used for unguent flasks. Dark blue vessels are present at the beginning of the study period and account for 6% or more of

the Claudian/Neronian tableware assemblages, with the exception of the Colchester 1 group. In assemblages ending in the early Flavian period there appears to be a trend towards a reduced presence of dark blue vessels, although Elginhaugh and London's Plantation Place 3 and GPO sites still show a significant proportion of dark blue. There is a sharp reduction in the amount of fragments in assemblages with an end date of the mid-A.D.80s onwards. The lack of dark blue is very striking in the huge Nijmegen assemblage, although it has been noted that these fragments may have been brought together as cullet (Chapter 4.8.1), and therefore some element of selection is a possibility. The absence of dark blue at Barzan however re-enforces the impression that by the end of the century it had effectively disappeared.

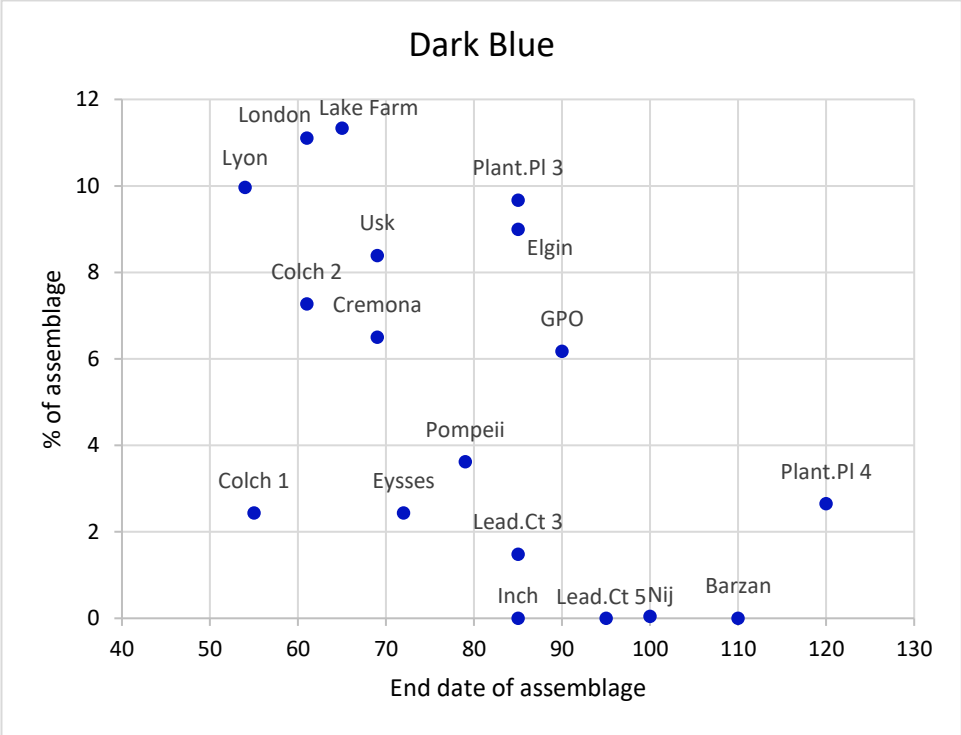


Fig.6.1 Quantities of dark blue in selected assemblages (% of minimum tableware vessels)

Figure 6.1 suggests a quite rapid decline in the circulation of dark blue vessels from the A.D.80s onwards, and it is worth looking closely at the groups dated to this decade. The groups from Elginhaugh and phases 303-304 at Plantation Place (Plantation Pl 3 in Fig.6.1) both show high percentages of dark blue vessels, contrasting with other contemporary groups such as Eysses, Pompeii, Inchtuthil and Leadenhall Court. Elginhaugh was a previously unoccupied site where glass arrived very probably in the

late A.D.70s. This means that the dark blue vessels were certainly circulating at this time. However, as the site was at the limit of Roman-controlled territory it was likely to be receiving supplies, including glassware, from military bases further south, perhaps Corbridge or Carlisle. A certain delay in the supply of fresh glassware to these northern sites must therefore be considered, though what that delay might have been is difficult to calculate. An examination of the small assemblages from the earliest contexts at Carlisle and Red House Corbridge shows that dark blue vessels are quite prominent. At Corbridge three of the 16 tableware fragments were dark blue – a high proportion, but difficult to evaluate in such a small assemblage. At Carlisle only three dark blue fragments came from a group of well over a hundred fragments in the earliest Roman phase, but it is notable that dark blue tablewares continue to occur in later contexts in the city. A dark blue mould-blown sports cup came from a mid-late Flavian context at Annetwell Street (Fig.6.2.a), and a dark blue mould-blown ribbed bowl (Fig.6.2.b), a dark blue jug and other fragments are also known from the Blackfriars site.


a


b

Fig.6.2.a and b Mould-blown vessels from Carlisle © Tullie House Museum and Culture24

At Camelon, another Flavian foundation, there are three dark blue fragments in the group of 20 fragments from Flavian contexts and at Strageath there is a dark blue fragment in a Flavian context and two dark blue vessels (almost certainly 1st century in date) from Antonine contexts. It would seem therefore, that in Britain at least, dark blue vessels were current on sites founded in the A.D.70s. The relatively high incidence of dark blue at Plantation Place would also suggest their presence in Flavian London. However, the Plantation Place site is thought to have been subject to some redeposition of earlier material to level the area (Dunwoodie, Harward and Pitt 2015, 79-102) and some of the

period 3 glass may be residual. Nevertheless, at the GPO site, on higher ground further to the west, dark blue still represents over 6% of the tableware assemblage, equivalent to the amounts seen at Cremona and Colchester, twenty or more years earlier.

The impression given by the large key sites of Cremona, Pompeii and Eysses is that dark blue was in decline by the A.D.70s. Nevertheless, the fact that dark blue vessels still occur on new foundations later in that decade shows that the colour was still in circulation, though perhaps the vessels in more peripheral sites persisted longer than in centres more closely connected to networks of exchange.

6.2.3 Dark Green

Dark green is one of the most intriguing of the strong colours. It has a distinctive emerald green colour which is generally easily distinguished from naturally coloured greenish glasses. The colour, which does not occur in pre-Roman vessels, was achieved by the addition of copper and manipulation of the furnace conditions. Dark green glass is the subject of an ongoing project examining the implications of the combination of its unusual composition and the range of forms into which it was made (Jackson and Cottam 2015; Jackson, Cottam and Lazar 2015; Cottam and Jackson, 2018). It is clear that dark green glass was not used, or used exceedingly rarely, in the manufacture of certain vessel forms, in particular monochrome non-blown ribbed bowls (Isings form 3), blown ribbed bowls (Isings form 17), as well as all forms of jugs and jars, whilst it was quite commonly used for non-blown 'fineware' forms (e.g. Isings forms 2 and 22) and blown wheel-cut cups (Isings form12). Furthermore, the analysis of dark green vessels indicates that they have elevated levels of potassium and magnesium, suggesting the addition of plant ash at some point in the manufacture of the raw glass. The question whether the plant ash was added as the constituent alkali in the manufacture of the base glass, or was incorporated as a source of particular elements that would enhance the production of the green colour is still a matter of debate (Jackson and Cottam 2015, 145). The details of this argument are outside the scope of this thesis, but the analytical study raises questions concerning the production of dark green glass and its supply to secondary furnaces, some of which are relevant here and which will be discussed in more detail in Chapter 8.

The picture given by figure 6.3 is of a fairly consistent breakage and disposal of green glass vessels at the majority of the sites during the A.D.50s-80s, albeit in relatively small amounts. Only rarely does dark green form more than 1-3% of the tableware assemblages and it is generally significantly less common than dark blue. However, on three sites, Cremona, Pompeii and Lyon, dark green has a particularly strong presence and at Pompeii and Cremona it is more than twice as common as dark blue. On Romano-British sites its presence is generally less than 4% of the total tableware assemblage. The point of decline of dark green is unclear. It is still as common in some assemblages ending in the A.D.80s and 90s as it was in earlier large groups such as Usk and Eysses. Its rarity – often complete absence - at sites founded in the A.D.70s is however revealing. It is not present at the Scottish sites in this study (Elginhaugh, Inchtuthil, Camelon and Strageath), nor at Red House Corbridge or, as a monochrome colour at least, at Carlisle. This absence strongly suggests that dark green vessels were not commonly available from the A.D.70s onwards in northern Britain, in contrast to their relative popularity at Pompeii.

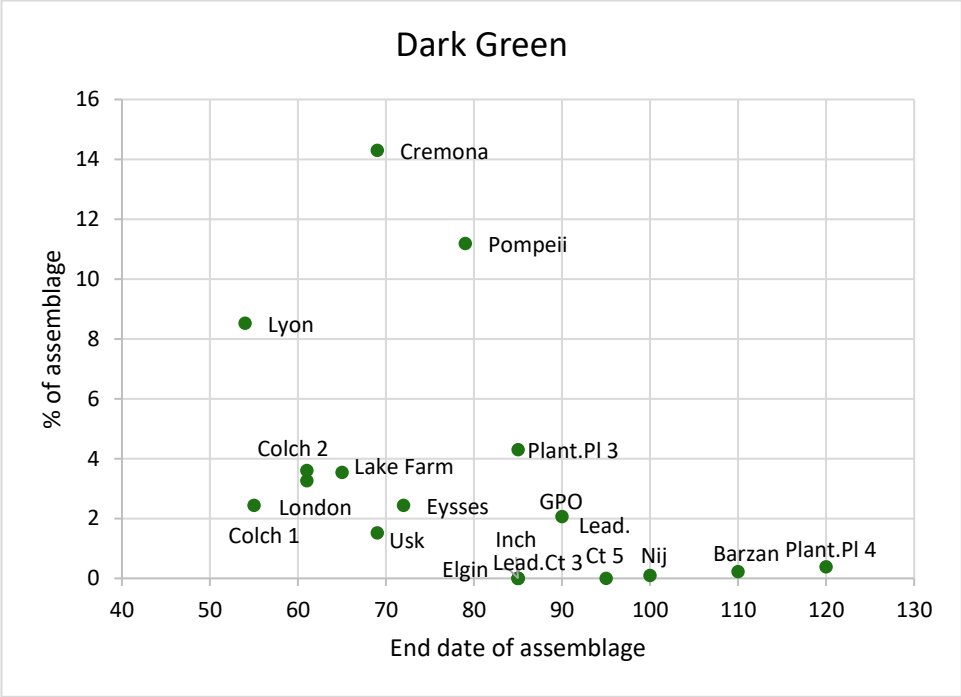


Fig.6.3 Quantities of dark green in selected assemblages (% of minimum tableware vessels)

In order to understand these contrasts more clearly, it is worth returning to the observations concerning the range of forms produced in dark green glass mentioned above. If dark green was only being used for certain forms, then a possible explanation is that supply to secondary furnaces was inconsistent, and that only certain producers had access to the colour. This might then have implications for the onward supply of vessels, with certain geographical areas, or particular groups of consumers having favourable opportunities to acquire dark green vessels. It is also possible that the timescale for the production of dark green was more limited than for other strong colours and that the overall quantity of dark green vessels was therefore reduced. Arguing against this scenario though is the interesting case of the group of non-blown bowls and plates with wide rims, flat bases and high base rings that were produced in the last quarter of the 1st century and the early 2nd century (chapter 5.3.3; Price and Cottam 1998, 55-59). These were most frequently made in colourless glass but are also occasionally known in strong colours and polychrome glass. Within this small group, dark green is particularly prevalent. One such dark green plate comes from the Cumbrian fort of Kirkby Thore, probably a Flavian foundation (Charlesworth 1959b, 38-40 Fig.3 no.3), and a polychrome example with a dark green ground is known from the Southern Lanes, Carlisle (Price and Cottam 2000b, 104 Fig.66 I1). The use of dark green to make this very late 1st century-early 2nd century form suggests the colour was still in circulation, though only used intermittently for certain forms, perhaps depending on availability and workshop preferences. The possibility that these bowls were being produced from recycled glass cannot be ruled out.

The variations in the occurrence of dark green in Fig.6.3 are puzzling and not easily explained. The small number of fragments at most of the sites suggests that it was never a particularly common colour with the exception of Lyon and the Italian sites. Whilst there seems to be a reduction in use in the A.D.80s and 90s, it is highly likely that in some areas the colour had gone out of circulation a decade earlier.

6.2.4 Purple

Purple glass has a history as ancient as dark blue glass, and purple ingots were found alongside dark blue glass ingots in the late Bronze Age shipwreck of Ulu Burun off the coast of Turkey (Aruz et al. 2008, 313-4). Purple was achieved by the addition of

minerals rich in manganese to the basic glass recipe. Manganese-rich minerals are amongst the more common metal compounds and were used not only in the production of purple, but also sometimes as a component of colourless glass.

Fig.6.4 illustrates the comparative rarity of purple as a colour within glass assemblages of the mid-later 1st century. In all but one of the groups, purple accounts for less than one per cent of the total tableware assemblage. It does not occur as a monochrome colour in many of the large Claudian-Neronian groups, including Usk, pre-Boudican London and the two pre-Boudican Colchester groups from the 70s and 80s excavations. Only five fragments were recorded by Donald Harden (compared to 106 dark blue) in the 1930s Camulodunum assemblage (Harden 1947, 288). On all sites in contexts dated between A.D.80 and the early 2nd century monochrome purple vessels do not occur at all. Perhaps the most compelling evidence for the general rarity of purple is that in the large multi-period assemblage from the 1971-85 excavations across Colchester, published in detail by Cool and Price, only six monochrome purple fragments occur out of total of over 6,300 fragments. Purple does occur, but again only occasionally, as a base colour for polychrome vessels. Individual purple vessels with opaque white elements occur for example at Colchester (Fig.4.2a, Fig.4.16i-j), Waddon Hill (Fig.4.28), Strageath and elsewhere.

The Lake Farm assemblage seems to stand apart from the general trend in Fig.6.6. Here, purple fragments represent 4.25% of the tableware assemblage. Whilst it is possible that some of these fragments might come from the same vessel, the assemblage has been calculated along the same lines as the other groups selected here, so the difference can be regarded as likely to be a genuine reflection of the occurrence of purple. The total (6 of the 141 tableware fragments) is nevertheless low in comparison with the number of dark blue fragments from the site (15 fragments).

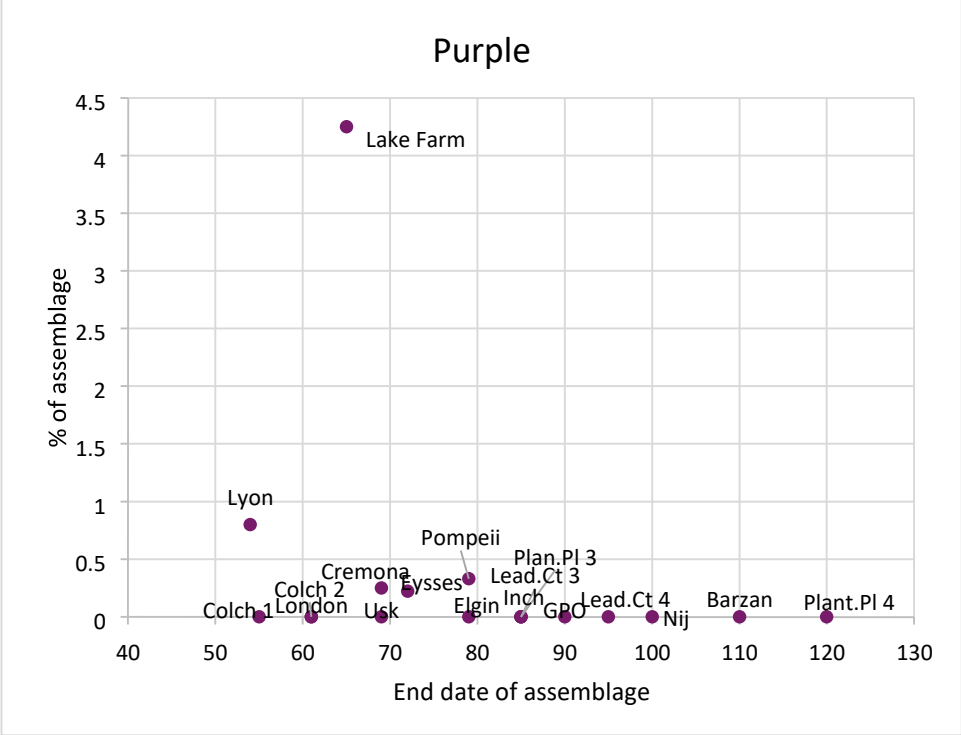


Fig.6.4 Quantities of purple in selected assemblages (% of minimum tableware vessels)

The rarity of purple stands out amongst the other strong colours and there seems no obvious explanation as to why. The colourants needed to produce purple (for example the mineral pyrolusite) are geologically plentiful and readily available in the areas where glass was manufactured in the near east (Freestone 2006, 211). Nor is purple glass known to be technically difficult to produce (C. Jackson pers comm). If this is the case, then other factors must be responsible for the rarity of the colour. It could perhaps be argued that purple glass was collected for recycling and is therefore absent from these 1st century contexts, however, it seems unlikely that purple would be recycled to a greater extent than either dark blue or dark green, nor does it continue to appear in later contexts. A further unusual feature of purple is its absence in the manufacture of mould-blown sports cups, though it was very occasionally used for other mould-blown tablewares, such as a beaker from Eysses.

Purple is a particularly interesting colour in Roman glass as in other categories of material culture, and the production and use of purple has been much debated by scholars of the ancient world. Discussions of the use of the colour usually centre on the high premium placed on purple dyes extracted from the *murex* marine snail and the luxury

value and elite status of purple-coloured products. The connection between purple textiles and high rank in the Roman world is well established and has been commented upon by both ancient authors and contemporary scholars (see Bradley 2009 197-201). Shades of purple also occurred naturally in other highly prized materials, such as marble (porphyry) and gemstones. Attitudes to purple in textiles and other luxury items must surely have had an impact on the reception of the colour in other classes of artefact. The possibility that unknown restrictions were in place on the production and distribution of purple glass vessels is worth consideration, since the control of the use of purple in other contexts is recorded as occurring in the 1st century A.D. (*Suet. Nero,* 32). The relative rarity of purple vessels will therefore be considered alongside more general attitudes to colour in the early imperial period in Chapter 8.

6.2.5 Yellow/brown and yellow/green

Both yellow/brown and yellow/green glass were coloured by iron-sulphur compounds present in the glass mix, probably introduced with the sand rather than as specific colour additives, though individual batches may also have seen the addition of organic material to encourage reducing conditions in the furnace (Schreurs and Brill 1984; Fleming 1999, 138-140; Jackson, Price and Lemke 2009). The concentration of iron, in combination with furnace conditions, produced a wide variety of shades in both colours. In this respect, these shades differ from other colours in the glass palette, as they rely to a greater extent on the manipulation of furnace conditions either in primary or secondary workshops, with the move from greenish shades to yellow/brown being dependent on the supply of oxygen in the furnace.

Yellow/brown glass can range from a pale amber to a deep chocolate brown and yellow/green glass can range from pale shades through to dark olive green. For this reason, they are more difficult to classify as specific colour groups. Vessels at each end of this spectrum have a very different visual impact. Creating divisions within the range is not practicable, as the shades do not fall into discernible brackets, and subtle differences can rarely be deduced accurately from descriptions in published reports. Despite these drawbacks, it is worth reviewing the occurrence of yellow/browns and yellow/greens, even if it has to be in general terms. Vessels in these shades are often seen as surviving, though in reduced numbers, later than other strong colours. Individual

vessels certainly occur well into the 2nd century A.D., as for example at Towcester, Northamptonshire where a yellow/brown and a yellow/green jug came from a pit dated c.A.D.155-165 (Price 1980, 66 nos.7 and 9, Fig.15) and Alcester, Warwickshire where two dark yellow/green jugs were found in a pit dated to c.A.D.150-160 (Fig.8.5; Price and Cottam 1994, 224 nos.9-10, Fig.104).

In the selected assemblages plotted in Fig.6.5 yellow/brown vessels are never particularly numerous, with the exception of a few early sites, most notably Usk where the occurrence was 10% of the tableware assemblage. Yellow/brown seems to be generally less common than dark blue, and whilst comparable in general frequency with dark green, there are striking differences in the occurrence at specific sites such as Cremona, Pompeii and Lyon where dark green is much more strongly represented.

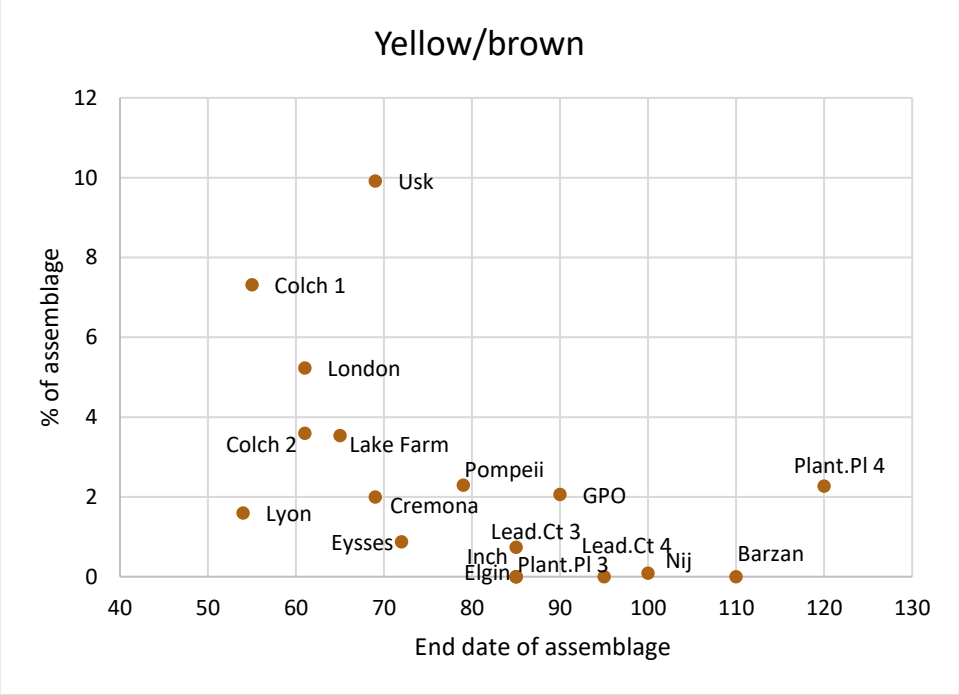


Fig.6.5 Quantities of yellow/brown in selected assemblages (% of minimum tableware vessels)

There appears to be a decline in its occurrence from the A.D.70s onwards, and it does not occur in Flavian contexts at Inchtuthil (an assemblage of 99 fragments with 44 minimum vessels) and Elginhaugh (assemblage of 202 fragments with 41 minimum vessels). There are a few yellow/brown fragments in early contexts at Carlisle, with

yellow/brown non-blown ribbed bowls (Isings form 3) found at Castle Street and the Millennium site. Evidence from the selected assemblages suggests that yellow/brown was one of the more common of the strong colours for this form whilst yellow/green is much more rarely used.

The occurrence of yellow/green across the selected sites is in some ways comparable to yellow/brown in that both colours rarely form more than 4% of the total assemblage (Fig.6.6). However, there does not seem to be the decline in use seen for yellow/brown, dark blue and dark green. The colour is quite strongly represented at the two Flavian sites in Scotland and occurs in smaller quantities in the late 1st and early 2nd centuries at Nijmegen and Barzan.

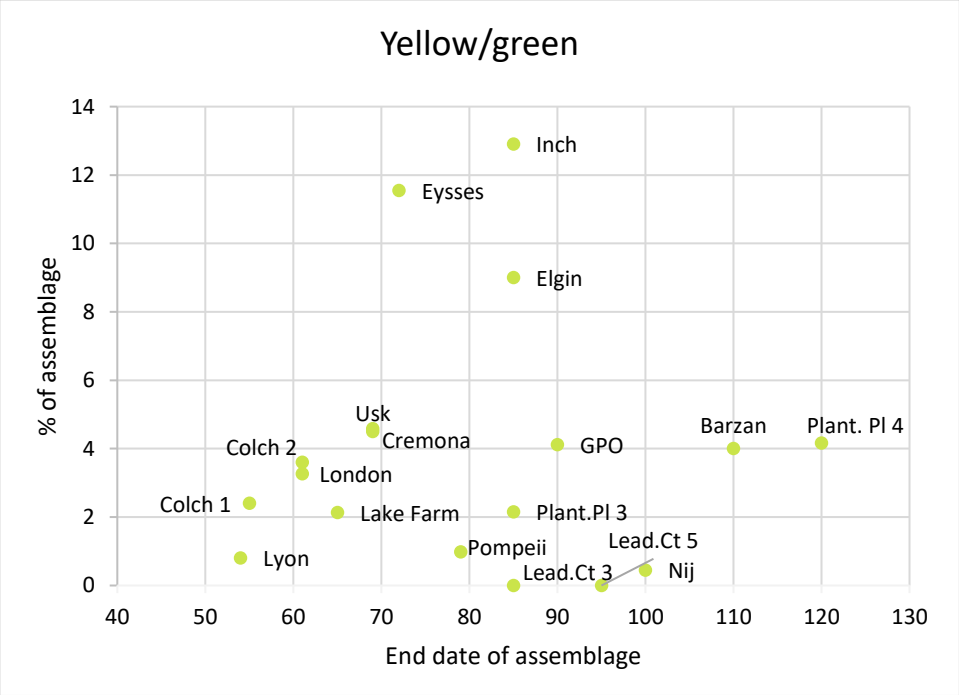


Fig.6.6 Quantities of yellow/green in selected assemblages (% of minimum tableware vessels)

Particularly high incidences of yellow/green were noted at Eysses and Inchtuthil. The Inchtuthil group is small and therefore perhaps statistically less significant, but the fact that yellow/green is the only 'strong' colour found at the site does perhaps hint at a longevity beyond other deliberately coloured glasses. The assemblage from Eysses is

much larger and therefore perhaps gives a more accurate picture of the distribution of the colour across different form categories (Fig.6.7).

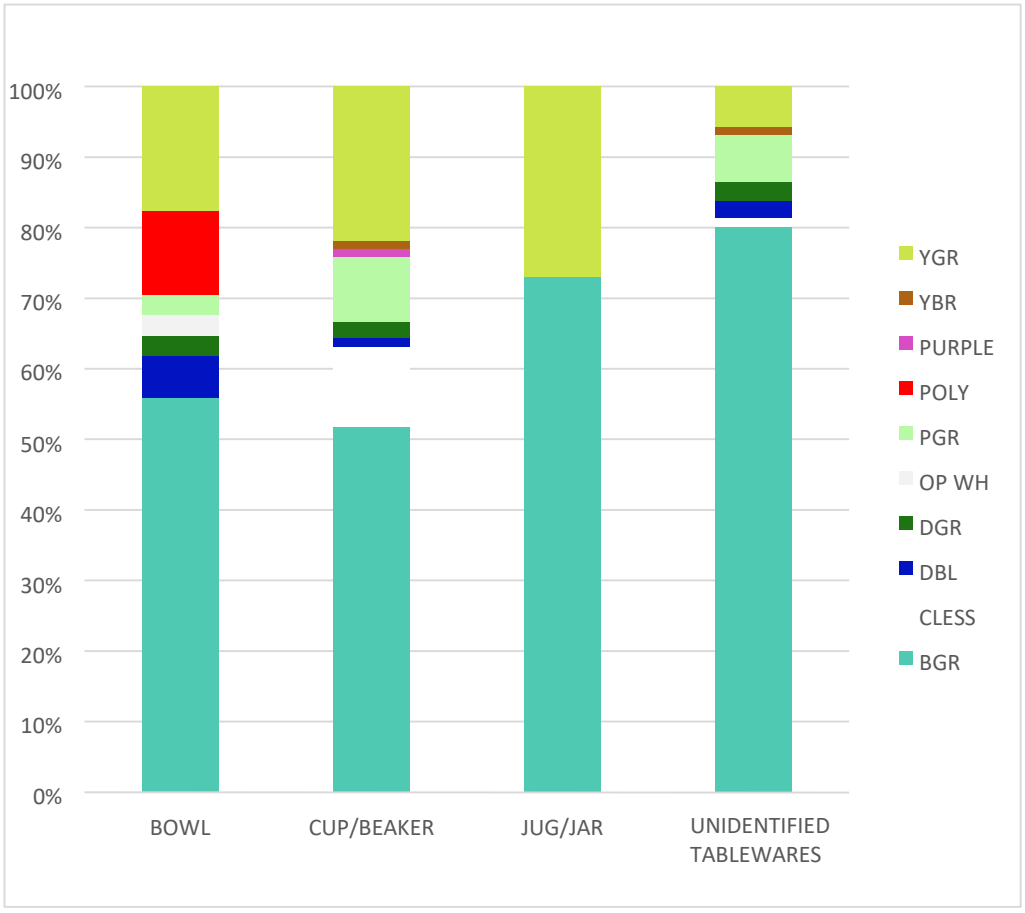


Fig.6.7 Percentage of each colour by general form, Eysses (assemblage of 472 tableware vessels)

Here, yellow/green makes up nearly 12% of the total tableware assemblage and is the only colour other than blue/green used for jugs and jars (Fig.6.7). Seven of the twenty mould-blown vessels are yellow/green, making it the most popular colour for these forms next to blue/green (8 vessels) with other colours represented by only one or two vessels each. Whilst there are no yellow/green non-blown ribbed bowls (Isings form 3), it is again the second most frequently recorded colour for blown bowls and for drinking vessels. There is no readily apparent explanation as to why Eysses should have elevated levels of yellow/green. A local preference for the colour over other shades is possible, as are differences in furnace conditions in the workshops responsible for supplying glassware to the area.

Other differences in the range of forms made in yellow/brown and yellow/green glass are hinted at in the data from the selected assemblages. Yellow/green appears to be used rarely for non-blown vessels, but is quite frequently used for blown and (as at Eysses) mould-blown vessels. Yellow/brown mould/blown vessels are very uncommon and non-blown ribbed bowls are unusual in both colours.

6.2.6 Colourless

The development of colourless glass and its relationship to the use of strong colours in the mid-later 1st century was identified as one of the more significant trends to be examined in this thesis. In Chapter 1 it was demonstrated how current thinking on the rise of colourless glass has tended to see it as replacing strongly coloured and polychrome glass in the sector of luxury glassware. This approach is summarised in the major report on glass from the 1971-1985 Colchester excavations, where colourless glass is described as 'very rare until the late Neronian period and thereafter becomes the preferred medium for good-quality tablewares… Before this, strongly coloured glass had been used for tablewares but such colours, both polychrome and monochrome, largely disappear during the mid to late 1st century' (Cool and Price 1995, 10-11).

Colourless glass was not a Roman invention and had been used in the manufacture of high quality Hellenistic monochrome and polychrome vessels, most famously perhaps for vessels from Canosa in southern Italy (Harden 1968b), dated probably to around the 3rd - 2nd century B.C. In the Julio-Claudian period, monochrome colourless vessels are extremely rare, but colourless glass was used in the composition of polychrome vessels as a matrix for other colours. Flattened canes where layers of colourless glass encase stronger colours such as opaque yellow are found in strip mosaic vessels, and colourless glass is used in the twisted canes of *reticelli* bowls. This use of colourless glass is seen in some of the earliest groups here, for example Colchester (Fig.4.123a and b).

The blue/green tints in raw glass are created by impurities in the sand. Purer sand gives a more colourless glass, and it is thought that the most decolourised glasses were produced by a combination of the use of pure sands and the addition of de-colourising agents to the glass recipe, such as antimony, and, to a much lesser extent in the 1st century, manganese (Jackson 2005; Paynter 2006). Glass described as colourless often has a slight

yellowish or greenish tinge and as a result there can be confusion between very pale green glass and shades of colourless glass, with different specialists using different descriptive terms. In this thesis a decision has been taken to include in the analysis only vessels that are convincingly the result of a deliberate attempt to produce a colourless glass.

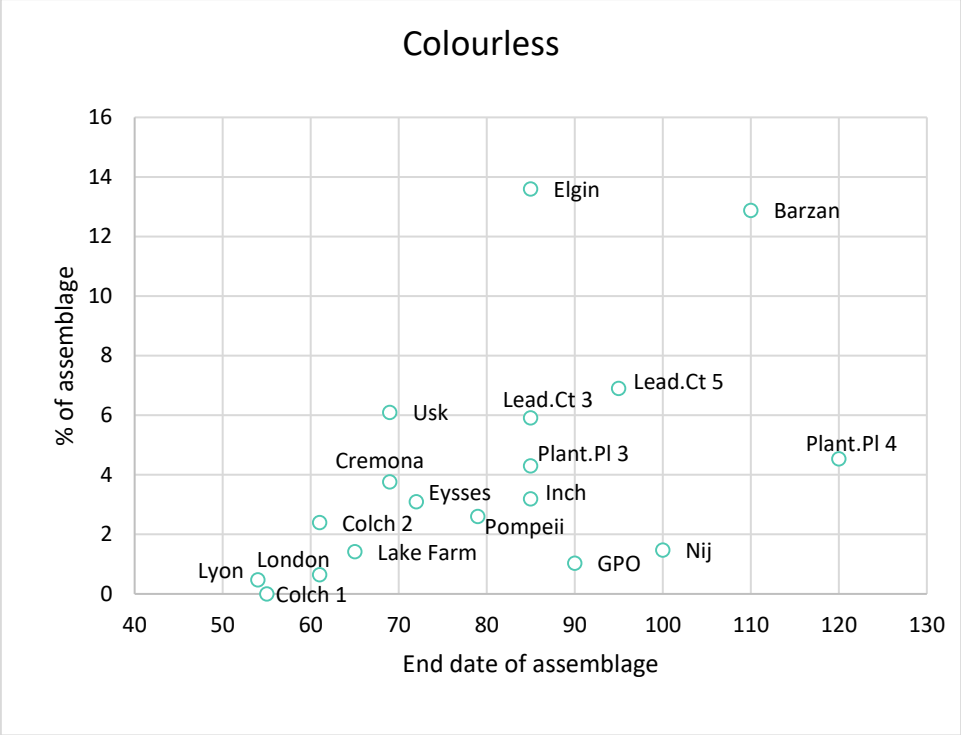


Fig.6.8 Quantities of colourless glass in selected assemblages (% of minimum tableware vessels)

Figure 6.8 reveals a steady increase in the amount of colourless glass in the selected assemblages, though at only two of these sites (Elginhaugh and Barzan) does the total exceed around 6-7%. From being barely present at mid-1st century sites such as Lyon and pre-Boudican Colchester and London, the occurrence of colourless glass rises during the A.D.60s and 70s, to reach totals mostly falling between 2% and 6% with an average across sites from A.D.69-120 of 4.5%. On this basis colourless glass can be regarded as never surpassing the popularity of dark blue during the study period, but being perhaps generally as common as dark green and a little more common than yellow/brown and yellow/green.

The exact point when colourless glass becomes a significant feature of glass production is difficult to pinpoint exactly, and may have varied according to region and type of site.

Some of the more accurately dated assemblages in this study may provide clues to a more precise timescale for this development. One of the earliest dated colourless vessels comes from a Neronian context at Colchester (Fig.4.3.6; Charlesworth 1985, 3:F9 no.84 Fig.82). If this dating is correct, then this is one of the earliest truly colourless blown vessels. The clarity of the glass, the rim finishing and close-set horizontal wheel-cutting are comparable with later vessels however, and the possibility that the cup is intrusive from later activity has to be considered. Another early colourless vessel is represented by a rim fragment, perhaps from a jug or flask, from a period 2 (pre-Boudican) context at Borough High Street, Southwark.

As with dark green, the use of colourless glass was restricted to certain vessel types, but to an even greater degree. Whilst most strong colours (with the exception of dark green) and polychrome glass were used to make the full range of glass tablewares – cup, bowls, jugs and jars – colourless glass is primarily associated with drinking vessels. Figure 6.9. shows the most common general vessel forms recognised from fragments of colourless glass from all the sites in the study and across all periods.

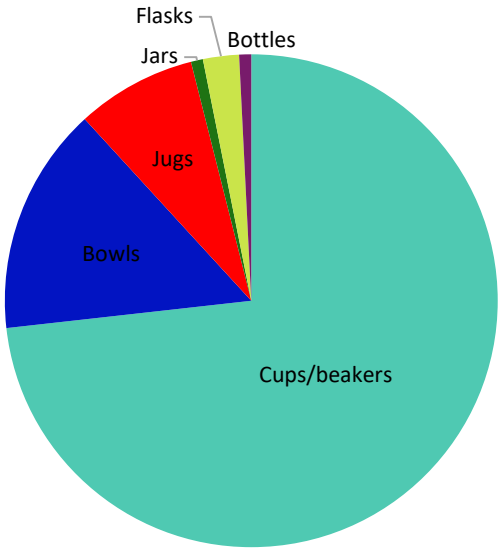


Fig.6.9 Colourless forms, all bands

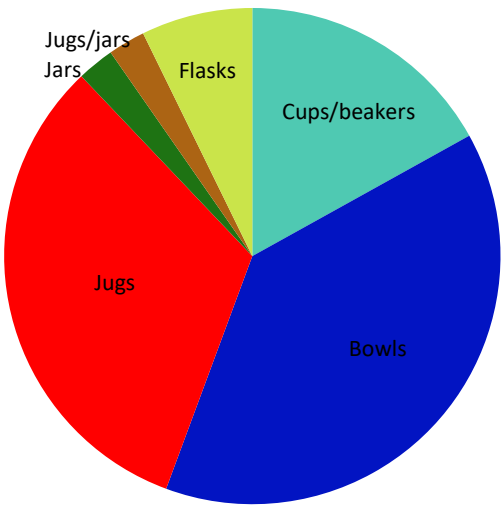


Fig.6.10 Dark blue forms, all bands

The very high proportion (73%) of the forms identified as drinking vessels provides a striking illustration of how most colourless glass was being used. The ability to see the true colour of liquids, such as red wine, being presented in the drinking vessel, may be a factor here. However, throughout this period colourless glass was only infrequently used

for serving vessels such as jugs, jars and flasks, vessels that might have be used to serve wine at table. When a similar calculation is done for dark blue glass (Fig.6.10), the most common of the strong colours, it is bowls closely followed by jugs that are the largest groups, with drinking vessels forming only 17% of the total. The fact that the very common non-blown ribbed bowls (Isings form 3), which account for exactly half of the bowls made in dark blue glass, were never produced in colourless glass also heavily influences the ratio of colourless drinking vessels to bowls during this period. The absence of colourless ribbed bowls is symptomatic of a general trend in colourless glass. It was almost never adopted in the production of pre-existing forms, such as ribbed bowls (Isings form 3), non-blown 'finewares' forms (such as Isings form 2, 5 and 22), wheel-cut beakers with solid bases (Isings form 34) and wheel-cut cups (Isings form 12). Whilst some of these forms may no longer have been in production when colourless glass began to be used more regularly, some, such as the ribbed bowls and wheel-cut cups continued in use well into later 1st century. Colourless glass then is strongly associated with new forms.

Fig.6.8 suggests that the decade between A.D.60 and A.D.70 is the point at which there is a significant rise in use of colourless vessels. At Xanten, destroyed in A.D.69/70, a colourless cast scyphus, a colourless blown wheel-cut beaker and a beaker decorated with both indents and facets were identified. This last vessel, along with largely contemporary colourless beakers from Leadenhall Court London, Usk and Eysses represents a new tradition in glass decoration which exploited the clarity of colourless glass and involved complex cutting on the outside surface. These externally-ground vessels, usually beakers, are almost exclusively produced in colourless glass. The glossy interior surface indicates that the beakers were initially blown, and once cooled were processed by cutting and polishing across the entire exterior surface. The ground and polished surfaces on the bases of these vessels provide strong evidence that the base rings were also ground from the blank (Oliver 1984 and Cool and Price 1995, 71-76).

The most common type of complex cut decoration was facet-cutting, with short vertical ovals closely set side by side in rows to form a diamond lattice (Fig.2.11.19). Variations on the facet-cut style as well as other designs appear early in the production of these externally-ground colourless vessels, first appearing on Roman colourless vessels in the A.D.60s and remaining in the repertoire of glass workers throughout the Roman period

(Harden 1987, 179-249). The origin and development of these traditions are discussed further in Chapter 8.3.

6.2.7 Opaque colours

All the monochrome opaque colours have been grouped together in Fig.6.11. Opaque colours may not have been regarded as a single group by the users of these vessels, but bringing them together produces a useful indication of their occurrence in the mid-late 1st century, as individually they are so uncommon that the plotted data are unhelpful. Opaque glass as a whole in this study group only achieves its maximum representation of 1.5-2.5% of the total tableware assemblage at just three sites.

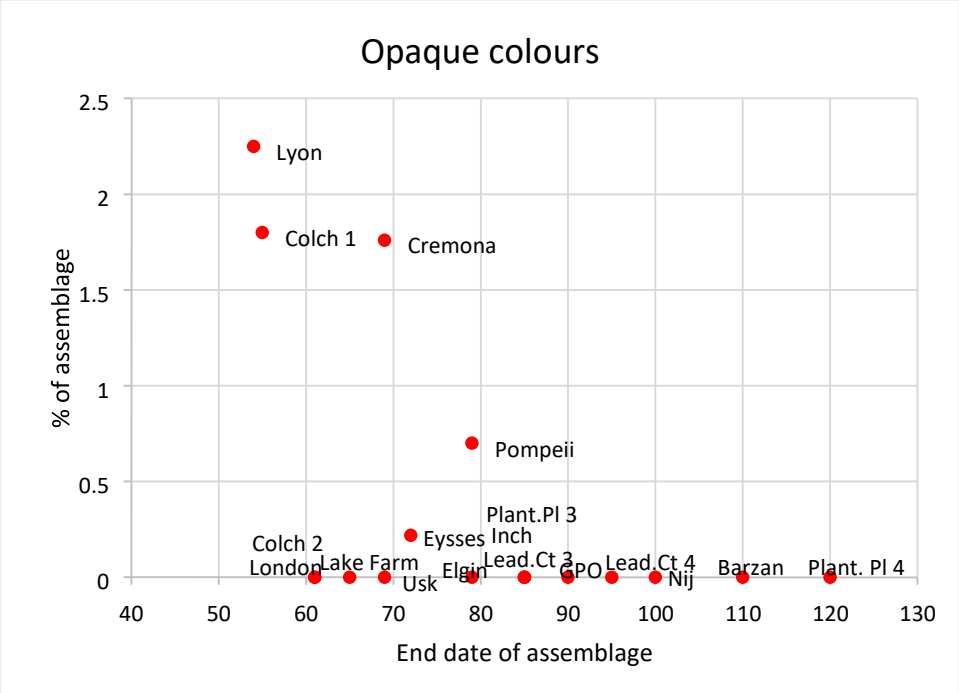


Fig.6.11 Quantities of opaque colours in selected assemblages (% of minimum tableware vessels)

At the majority of the selected sites, and at all those dated after A.D.80, opaque glass vessels do not feature at all. Few of the opaque fragments from this study are diagnostic, but where it is possible to determine the techniques used, they appear to come from both blown and non-blown vessels. Mould-blown opaque vessels do occur (for example small flasks) but are very uncommon and have not been recognised at any of the sites here.

Individual forms that could be identified include four non-blown ribbed bowls of Isings form 3 (all opaque white), three possible carinated non-blown cups of Isings form 2, all opaque blue, a non-blown bowl comparable to Isings form 20 from Pompeii in opaque red, and an opaque blue blown cup of Isings form 12. There were a further four blown cups and beakers, twelve non-blown bowls, and three closed vessels, either jugs, flasks or unguentaria.

	Blue	Green	Turquoise	White	Red	Total
Band A A.D.40s-mid -50s	8	2	0	4	2	16
Band B A.D.50s-c.60	6	1	2	3	0	12
Band C A.D.40s-60	4	1	1	0	0	6
Band D A.D.60s-c.70	10	1	0	5	1	17
Band E A.D.70s-c.85	1	0	0	0	1	2
Total	29	5	3	12	4	53

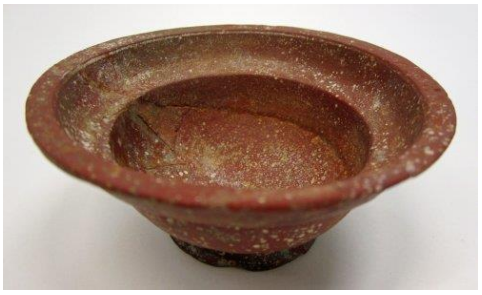
Table 6.1 Individual opaque colours within each dated band (minimum number of vessels)

The data here confirms the rarity of opaque vessels and adds a little further information. Opaque blue is by far the most common of the opaque colours used to produce monochrome vessels, whilst being very rarely seen as an element in polychrome glass. Opaque yellow is exceeding rare as a monochrome colour, whilst occurring relatively frequently as an element in polychrome vessels. Opaque white vessels are less than half as common as those in opaque pale blue, but white is overwhelmingly the most popular colour as an element in polychrome glass.

Opaque glass was produced in different ways according to the colour required. The production of opaque red relies on a highly reduced atmosphere working on a copper-coloured glass (Fleming 1999 143-4). Opaque yellows and blues are produced by the addition of combinations of antimony and lead (Fleming 1999 144; Paynter et al. 2015). These complex processes, involving the subtle manipulation of ingredients and furnace conditions could explain in part the rarity of these colours, and why their use was principally directed towards polychrome vessels where they could produce an eye-

catching effect in small quantities. This may be particularly the case with opaque yellow, which may have been a difficult glass to manipulate whilst hot (David Hill pers comm).

Certain opaque vessels, particularly those in white and red, closely resemble some contemporary ceramics both in colour and sometimes in form (for example Isings form 2, Fig.6.12.a and Dragendorff form 27, Fig.6.12.b) and may have been produced as deliberate novelties. Their complete lack of the quality which give glass so much appeal, its translucency, may have consigned such vessels to a role as occasional curiosities rather than items of wider interest.



a

b

Fig.6.12.a. Opaque red cup, Corning Museum of Glass b. Samian cup, Museum of London (© www.CMoG.org and Museum of London)

6.3.8 Pale green

Pale green vessels were also monitored across the assemblages, and their frequency is given in figure 6.13

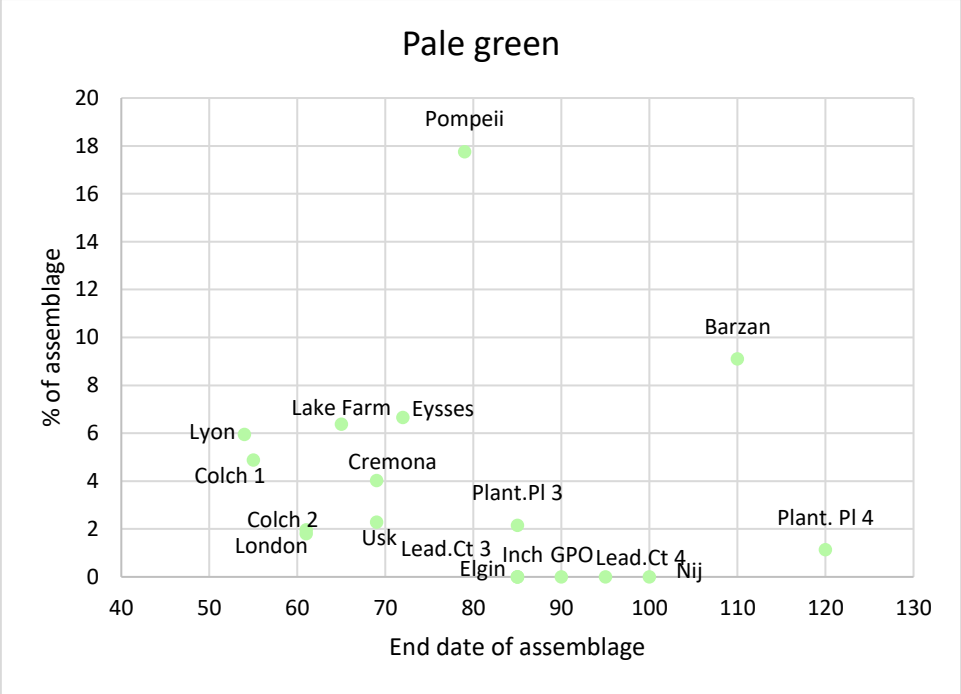


Fig.6.13 Quantities of pale green in selected assemblages (% of minimum tableware vessels)

Pale green vessels range between about 2-6% in bands A-E (c.A.D.40-80), though there is a particularly high proportion of vessels described as pale green at Pompeii. Thereafter, they are uncommon, except at Barzan, an assemblage deposited in the early years of the 2nd century. Pale green is a difficult colour to assess, as it is not necessarily the result of a deliberate colouration but rather a part of the natural blue/green spectrum. The interface between pale green and greenish/colourless glasses is difficult to establish. Only with compositional analysis is it possible to tell if a pale green fragment has been subject to any deliberate decolourisation. Description of the colour is also very subjective to individual interpretation. The graph is therefore included here for completeness of information, though the results are difficult to interpret at this point.

6.2.9 Polychrome

The category of polychrome glass is used regularly in glass catalogues and reports to describe a vast range of techniques and colour combinations. There are two main groupings, the first covers non-blown forms and involves the formation of vessels from pre-constructed elements, either cane lengths of multi-coloured strips and twisted rods,

or ‘polychrome mosaic’ where cane cross-sections are fused together. Non-blown polychrome vessels were constructed in a multi-stage process in which polychrome elements in different patterns were stretched and elongated before being cooled, divided and arranged into a disc before further heating and fusing (Fleming 1999, 7 pl E.5, 9 pl.E.6, 21 E.19).

Blown polychrome vessels were usually produced during a single phase of heating. A strongly coloured, or occasionally blue/green glass gather formed the ground colour to which polychrome decorative elements are added whilst hot. These were usually either opaque chips that expanded into blobs as the vessel was blown and manipulated, or opaque trails added as the vessel was finished (chapter 2.5.4).

Figure.6.14 shows the incidence of all polychrome vessels, both blown and non-blown, across the second half of the 1st century A.D. The first impression is of a sudden drop in the occurrence of polychrome in the A.D.60s. However, the two groups producing the largest proportion of polychrome in the first two decades of the study are both groups from a single place, Colchester. These assemblages from Colchester have two to three times as much polychrome glass as other pre-Flavian sites. Such a wide difference seems unlikely to correspond to preferences in the retrieval of brightly coloured distinctive fragments of glass, certainly in the case of the excavations of 1971-85, where all glass fragments retrieved were recorded. It is difficult to suggest other explanations connected perhaps to the nature of the site or the history of its early occupation without further evidence. If the Colchester sites are put to one side, then the reduction in polychrome glass is less dramatic. It only ever accounts for a very small proportion of all these assemblages, with a steady decline across the period. The small number of fragments means the occurrence of just one or two vessels can have a significant effect on this pattern. A review of some individual vessels and sites may help to establish a clearer chronological picture. The general scarcity of polychrome glass in Scotland strongly suggests that production had declined significantly by the mid-late Flavian period. It does not occur at Elginhaugh and Inchtuthil, though small amounts do occur at Camelon, and a single polychrome ribbed bowl (from a 2nd century context, but highly likely to be from 1st century occupation) came from Strageath.

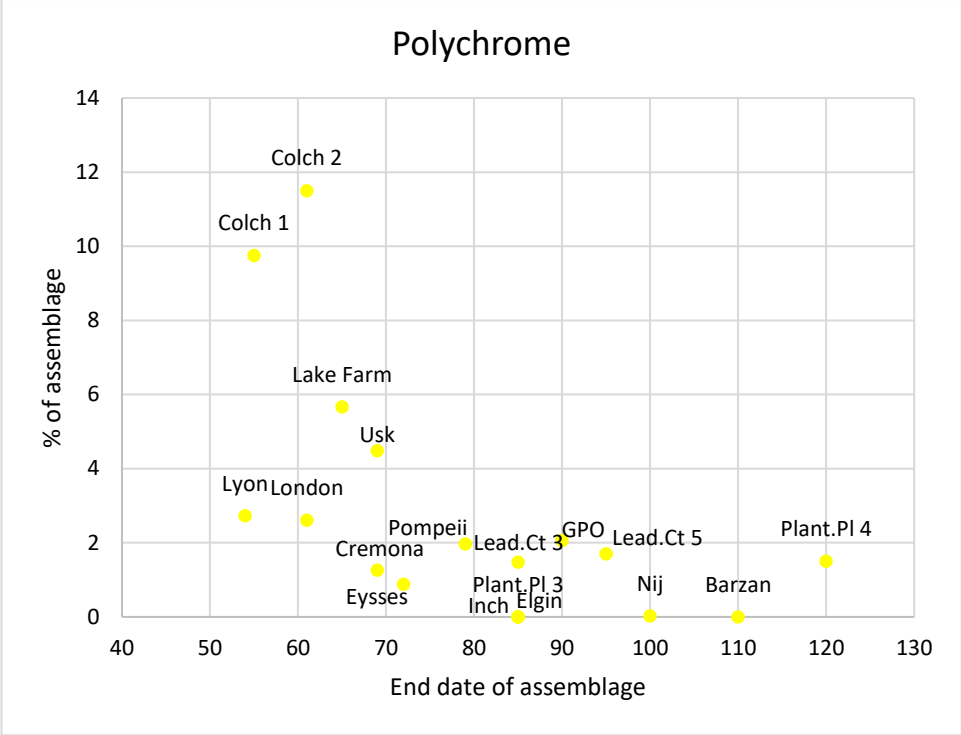


Fig.6.14 Quantities of polychrome in selected assemblages (% of minimum tableware vessels)

Substantial parts of a dark blue and opaque white ribbed jug came from the Fort Annexe ditch at Carlisle dated to the early-mid A.D.80s. The presence of polychrome at this date was remarked upon as being 'later than normally expected' (Cool 1992, 64-65) and it was suggested that it might have been 'a vessel that had never been used but just left in store', and therefore relatively old when deposited. It can be argued that some individual polychrome vessels remained in circulation for an extended period as they were highly decorative and may have been treasured items. This may well be true in some cases, but equally, polychrome vessels may have been more eagerly discarded, being very distinctively out of fashion once tastes had changed.

What figure 6.14 may then suggest, though tentatively, is that polychrome vessels continued to be used and disposed of through the later 1st century though in very small amounts. Fragments still occur at sites in London throughout that period and even into the 2nd century, although the levelling of surfaces at Plantation Place in the later 1st century referred to above may in part account for the continued appearance of polychrome in these contexts.

Whilst glass specialists take great care to differentiate between non-blown and blown vessels, it is debatable whether the distinction was as relevant to the users of these vessels. From the point of view of production traditions however, it is worth looking at whether there are major differences in the number and chronology of polychrome vessels produced in the two techniques. Table.6.2 gives the quantities of blown and non-blown tablewares in the selected assemblages and shows that relative numbers are generally similar across the period. Certainly, production does not appear to have continued in one tradition longer than the other.

SITE	Non-blown polychrome	Blown polychrome
Colchester 1	1	3
Lyon	7	5
Colchester 2	6	13
London, pre A.D.61	2	2
Lake Farm	4	4
Cremona	4	1
Usk	3	4
Eysses	4	0
Pompeii	2	5
London Plantation Place 3	0	0
Elginhaugh	0	0
Inchtuthil	0	0
London Leadenhall Court 3	1	1
London GPO	1	1
London Leadenhall Court 4	1	0
Nijmegen *canabae legionis*	2	4
London Plantation Place 4	3	1
Barzan	0	0
TOTAL	41	44

Table 6.2 Quantities of blown and non-blown polychrome tablewares in fully quantified assemblages (minimum numbers)

Blown polychrome glass was used for a much wider range of vessel forms than non-blown. Blown forms include jugs, jars and flasks, whereas non-blown polychrome forms are almost all bowls, mainly ribbed bowls of Isings form 3 (25 of the 39 bowls identified). This difference simply reflects the greater flexibility of blown glass already noted and the tendency for non-blown forms in general to be restricted to bowls and plates. Given the frequency with which non-blown polychrome ribbed bowls occur in the pre-Flavian period, their complete absence in the Pompeii and Cremona assemblages here is interesting and may reflect a general absence of the form in Italy in comparison to other contemporary sites further north and west (see Chapter 5.5.3).

Dark blue is the most common base colour in the production of polychrome glass, both blown and non-blown. Across the Colchester assemblages, polychrome vessels with a dark blue ground were nearly twice as common as the next colour combination (vessels with a dark green ground). Dark blue is particularly dominant in polychrome blown vessels whereas dark green is virtually absent as a ground colour, except in painted cups of Isings form 12. The intensity of cobalt-coloured blue glass provides an effective contrast when used as a ground colour in combination with lighter polychrome elements, in particular opaque white. However, the lack of dark green in blown polychrome vessels is intriguing and will be further discussed in the context of the production and distribution of colour across the glass industry in Chapter 8. Colourless glass is very rarely used as a ground colour for polychrome vessels in the 1st century A.D., and this may reflect the chronology of production, with polychrome fading in popularity as colourless glass gains ground.

Colourless glass only occurs as a component in polychrome vessels in the very earliest vessels in this study, those formed from lengths of canes, either strip mosaic or *reticelli* glass. Table 6.3 shows the occurrence of these types of polychrome, which occur at only four of the sites.

	Colchester	Hod Hill	Lyon	Pompeii
Reticelli	1	1	1	
Strip mosaic	2		2 (with gold leaf)	2 (with gold leaf)

Table 6.3 Polychrome with colourless components (minimum numbers)

Reticelli and strip mosaic vessels are never common. Even in earlier assemblages with relatively high levels of non-blown polychrome glass, they are uncommon. In the large assemblage from Fréjus on the French Mediterranean coast there were 18 strip mosaic and 7 *reticelli* vessels, in an assemblage of nearly 4,200 fragments dating from the Augustan-Claudian period (Cottam and Price 2009, 186-188). At Nijmegen at the Kops Plateau and the *Oppidum Batavorum*, both occupied from the Augustan to Flavian period, there are just two strip mosaic vessels (van Lith 2009, 17 no.9, 51-2 no.1 Fig.16). Very few strip mosaic vessels come from Roman Britain, which strongly indicates that they may have ceased to be produced at this point. In their report on the glass from Colchester, Cool and Price note six pieces from Britain in addition to the two Colchester fragments noted here (Cool and Price 1995, 29-30). Four of the six strip mosaic vessels in this study incorporate strips enclosing gold leaf, a particularly rare form of strip mosaic.

6.3 Conclusions

The graphs in Section 6.2 illustrate how the frequency of each colour changed over a period of 60 years from c.A.D.40 to the beginning of the 2nd century. Factors that may have influenced the quantification of colours at individual sites have been taken into account and anomalies regarding the use of different colours in different vessel categories have been highlighted and discussed. No two colour groups follow identical paths, but some distinct trends do appear to be present. This final section will examine how far these trends interrelate. It will assess whether there are any governing themes which, when drawn together, might relate to changing attitudes to the presence of strong and polychrome colours in glass and to how different colours were employed in the production of different forms in the course of the later 1st century A.D. Consideration will also be given to how these smaller colour groups behave alongside the continuing dominance of naturally coloured blue/green vessels.

As a first step in this task, data relating to all eight of the colour categories analysed in Section 6.2 have been combined in a single plot (Fig.6.15). Adding overall trend lines to the individual colour scatters simplifies this picture. Six of the colour categories, dark

blue, dark green, purple, yellow/brown, opaque and polychrome, show a decline in frequency over the study period. Yellow/green has a more mixed picture, whilst only colourless shows a clear increase in occurrence.

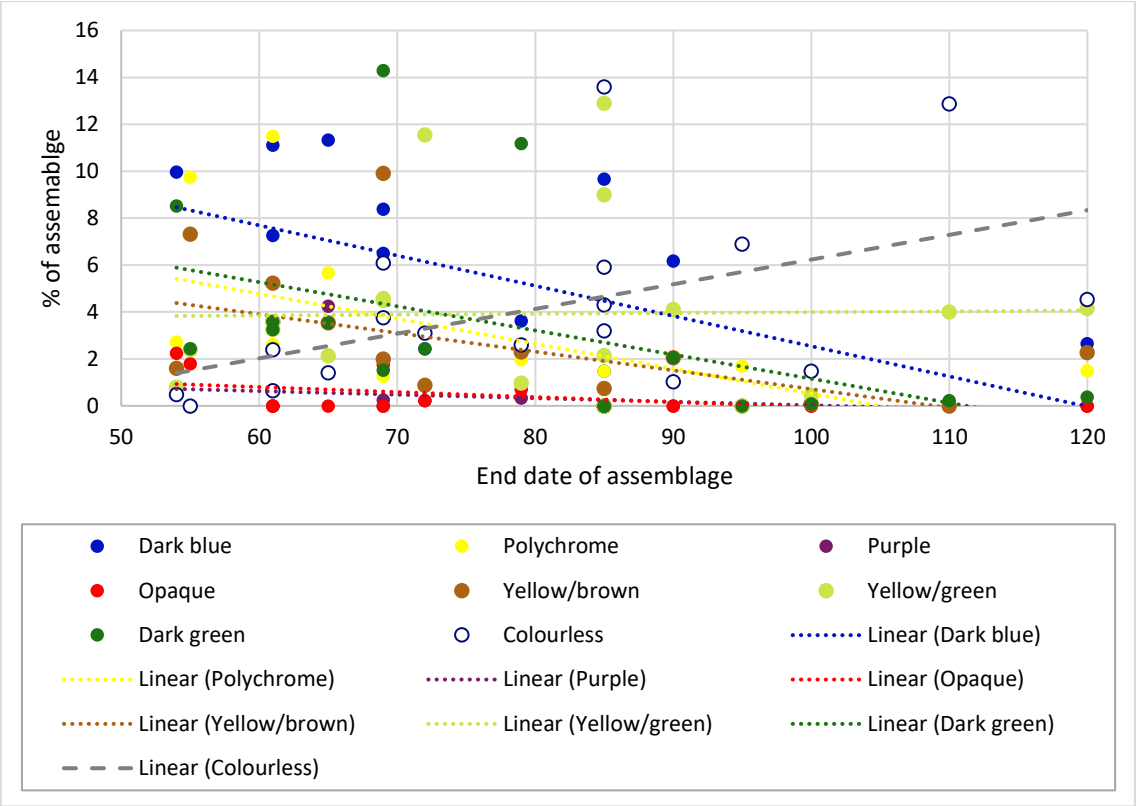


Fig.6.15 Occurrence of glass colours c.A.D.50-c.120 (figs 6.1, 6.3-6.6, 6.8, 6.11, 6.13-6.14 combined)

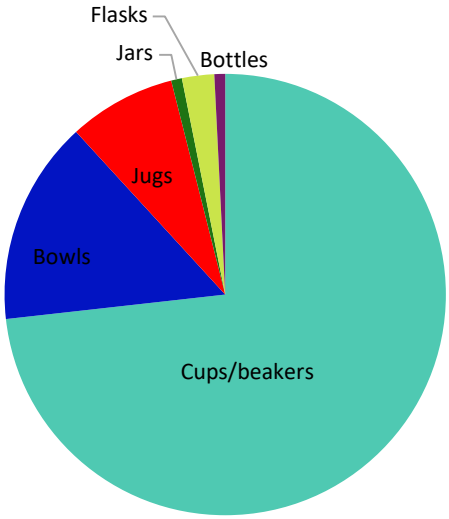
Whilst it has long been known that the occurrence of strongly coloured and polychrome glass declined in the second half of the 1st century, the rate at which this happened has not been previously established, nor is it clear whether all these colours declined at the same time, or whether some disappeared more quickly than others. Similarly, colourless glass is known to increase in popularity, but is it reasonable to say that it *replaced* strong colours as the glass of choice for high quality vessels? One of the original objectives of this thesis was to try to answer these questions with more certainty and the information presented here contributes significant additional information.

Looking back at the data summaries, there are some subtle but important differences in the rates of decrease in the occurrence of fragments in different strong colours. As a

general observation, polychrome colours appear to be the earliest to decline, with a noticeable drop in the A.D.60s and 70s. Yellow/brown equally, in particular dark chocolate brown, seems to decline from the A.D.60s. Dark blue and dark green however, seem to decline a little later. Dark green is still relatively common at Pompeii, dropping away in the A.D.80s, and dark blue similarly appears to drop most rapidly during that decade. As dark blue continues to feature on sites in northern England and Scotland in mid-late A.D.70s it may be that it survived in circulation slightly later than dark green, which is very rare at these sites.

What these observations suggest is that the movement away from strong colours and polychrome may not have been a single cohesive phenomenon and that certain colours, notably dark blue and to a lesser extent dark green retained popularity for a short time after other colours such as polychrome and deep yellow/brown began to wane. However, blue and dark green are the best represented colours numerically, and whilst the data is based upon colours as a percentage of the total tableware groups at each site, and not on actual numbers, there is a possibility that the data for dark green and dark blue are more meaningful, being based on a greater proportion of the assemblage.

In contrast to strong colours and polychrome, colourless vessels generally increase as a proportion of tablewares across the study period. The data from the selected sites suggest that this increase may begin during the A.D. 60s, at much the same time as the decline in the number of polychrome vessels being discarded is first manifested. A direct link between these trends is very difficult to establish. Colourless glass does not replace polychrome or strongly coloured glass in terms of the specific forms of vessels in which it is produced. Where they are recognised, colourless fragments are overwhelmingly from drinking vessels (Fig.6.16.a), whereas polychrome and strongly coloured glass are used for a much wider range of forms (Fig.6.16.b).



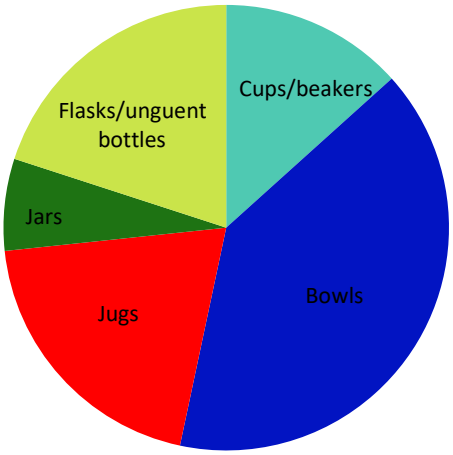


Fig.6.16.a Colourless glass forms, all sites Fig.6.16.b Polychrome glass forms, all sites

Nor do the data support an argument for a direct change in preference from monochrome strongly coloured vessels to colourless vessels. Throughout most of the second half of the 1st century, the combined totals of strongly coloured vessels being discarded at the selected sites is considerably higher than colourless until the A.D.90s (Fig.6.17). The actual quantities of colourless glass still remain relatively small at these sites, only reaching 12% at the most, even in the early 2nd century. It is conceivable that strongly coloured vessels were being actively discarded, having become outmoded, thus appearing in greater relative numbers in the data, whilst newer colourless forms were preferentially retained.

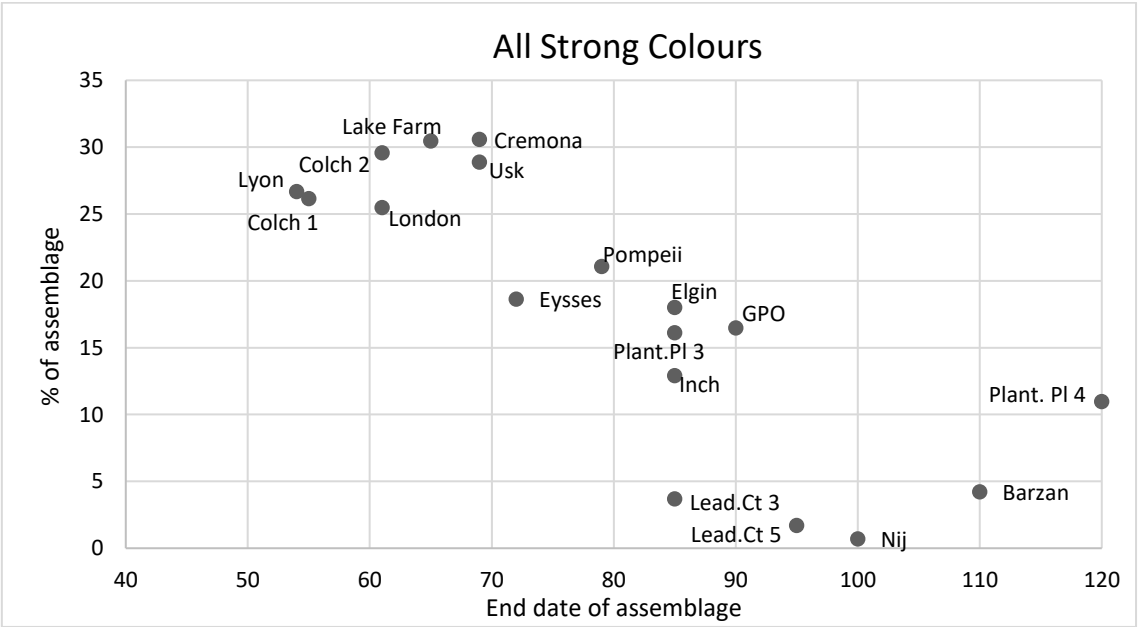


Fig.6.17 Proportions of all strong colours in selected assemblages

However, as was the case with polychrome glass, the range of forms produced in strong colours is more varied, embracing a much wider range of bowls and jugs than colourless, as demonstrated by the range of forms produced in dark blue glass (Fig.6.18)

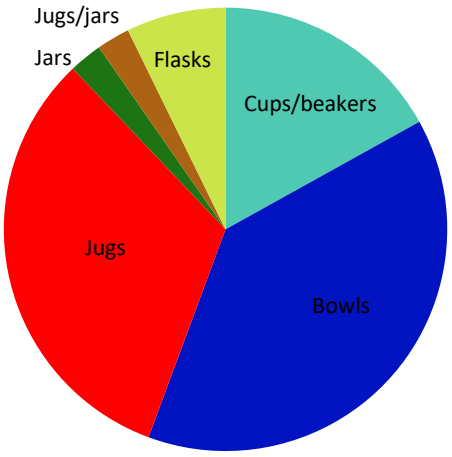


Fig.6.18 Dark blue glass by form, all sites

Further tentative evidence comes from the proportions of blue/green tablewares from the same sites (Fig.6.19). Here the overall proportion of blue/green tablewares rises across the study period. If colourless vessels as a whole were replacing strongly coloured and polychrome glass, then the proportion of blue/green might be expected to remain fairly constant over time.

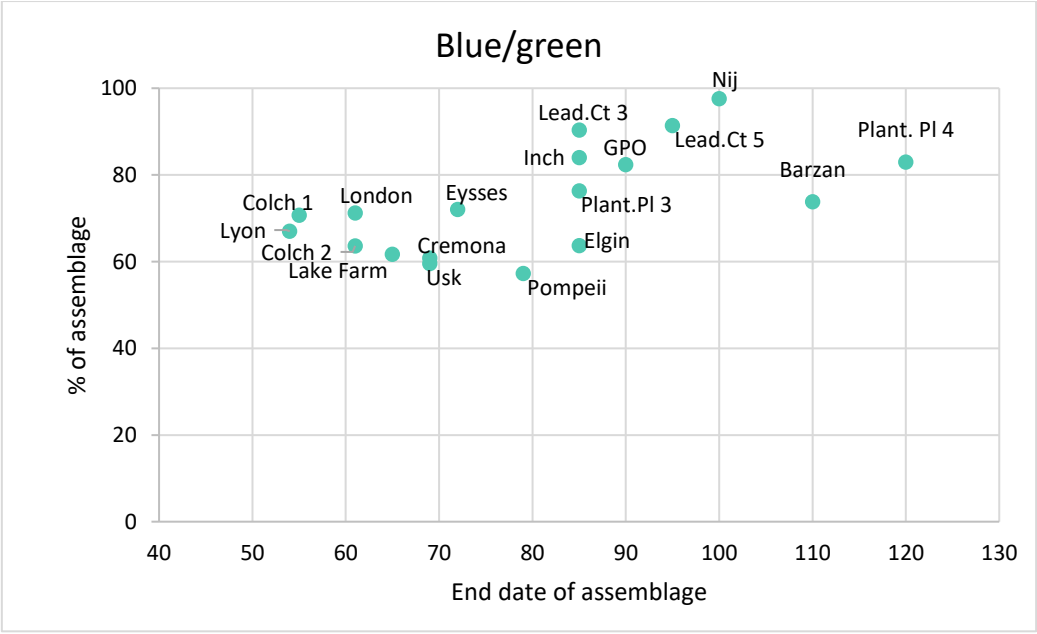


Fig.6.19 Quantities of blue/green tablewares in selected assemblages

Though found in relatively small quantities throughout the later 1st century, colourless glass nonetheless has a widespread presence. Table 6.4 shows the number of sites at which one or more colourless vessels occurred, compared to polychrome, dark blue and dark green. Its distribution equals that of dark blue but is slightly wider than polychrome and dark green and two of the most numerous strong colours, dark blue and dark green. suggesting that irrespective of actual numbers of fragments, there was a widespread take-up of colourless glass.

Band (no.of sites)	Colourless	Polychrome	Dark blue	Dark green
A (5)	3	5	4	4
B (5)	2	5	5	3
C (5)	5	4	5	4
D (8)	7	8	7	8
E (5)	5	3	5	4
F (6)	6	1	4	0
G (4)	4	2	2	3
Total (out of 38)	32	28	32	26

Table 6.4 Number of sites where vessels in colourless, polychrome, dark blue and dark green glass occur by dated band

This may point to a high level of penetration of colourless vessels across the region, while at the same time only small numbers of these vessels were being produced and acquired. In this respect it sits alongside other colours, complementing and diversifying the vessel repertoire. Colourless glass therefore stands out for a number of reasons; the forms in which it occurs, the particular methods of decoration employed and its chronological and distributional presentation. The extent to which colourless vessels continued earlier traditions or fulfilled a different role to high quality glass in other colours is also discussed further in Chapter 8.

The data here then, point to an increase in the use of blue/green glass for the production of tablewares, taking over from strong colours in a manner often attributed to colourless vessels alone (see Chapter 1.1.2). Blue/green was also used across a similar range of

tableware vessels to strong colours, covering not just drinking vessels, but bowls, jugs and jars, taking more of a dominant role in these forms as strong colours died away. This spread of forms is illustrated by the blue/green tablewares from Leadenhall Court, London, periods 3-5 (c.A.D.75-100), where the numbers of bowl and jug fragments equate well with drinking vessels (Fig.6.20).

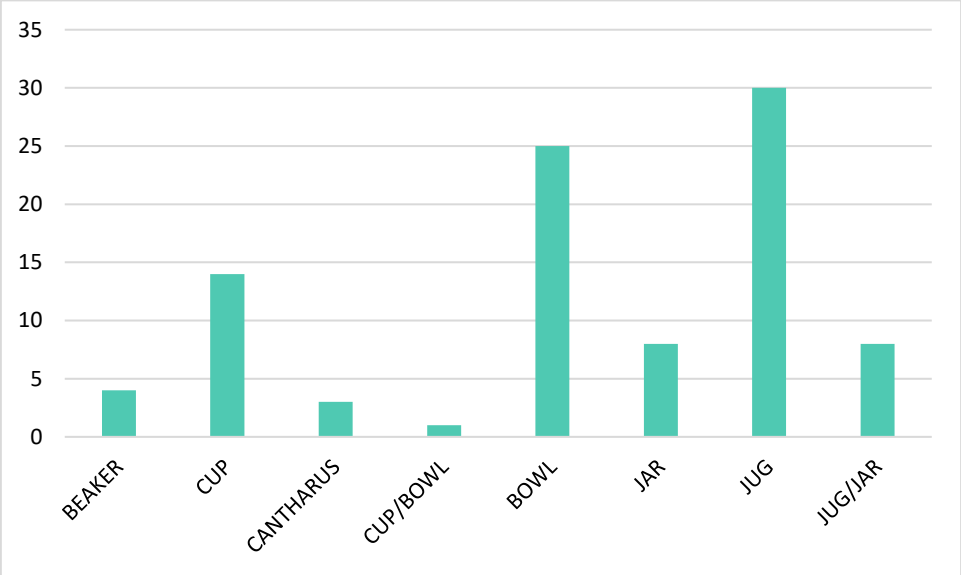


Fig.6.20 Vessel forms in blue/green glass, bands F and G, Leadenhall Court, London

The question remains as to where the stimulus for the reduction in the use of strong colours originated. The answers may lie within the complex stages of production beginning at the raw glass furnaces and moving along the chain to the secondary workshops where vessels were formed. The resources needed to produce strong coloured glass may have come under greater pressure as the secondary industry expanded across the north-western provinces, access to a supply of coloured glass may have become compromised for some workshops and regional preferences may have played a role. The increase in demand for blue/green glass for the production of bottles and window glass may also have been influential. The following chapter will examine aspects of the developing industry that may have influenced these trends, in particular the expansion of provincial workshops and the demand for and supply of blue/green glass.

Chapter 7
Development and Change in the Glass Industry

7.1 Introduction

7.1.1 The glass industry and vessel development

The last twenty years have seen a profound and radical change in our understanding of the organisation of the ancient glass industry and this is particularly evident in the study of early imperial glass. Previously, theories concerning the production of vessels in the western provinces relied upon sparse literary and epigraphic references in conjunction with equally patchy evidence from excavated workshops. Developments in archaeological science that allow the component parts of individual glass recipes to be identified have produced a fundamental revision of previously established models. At the same time there has been a considerable increase in the identification of production sites both for raw glass and for glass vessels.

The production of glass vessels is a complex process involving multiple agents with diverse skills within an extended sequence of activities. A simplified model of this sequence highlights four main stages; the manufacture of raw glass, the transfer of glass to secondary workshops, the production of vessels using hot processes and the cooling and further finishing of vessels when cold. Running in conjunction with these stages are a multitude of associated tasks and requirements involving infrastructure, workforce, equipment, skills and social and commercial relationships in an interrelated system subject to myriad pressures and variabilities. Figure 7.1 links these stages to some of the associated requirements and activities that should be considered when seeking to understand changes in glass production. Some of these considerations are practical, such as the construction of workshops and the acquisition of ingredients. Others relate to the development of specialist glassmaking skills and to the relationships between agents within the chain.

Stages **Considerations**

Raw glass production

→ Construction and management of furnace
→ Fuel supply
→ Availability of ingredients
→ Access to colourants
→ Size and skill-set of work force

Transfer of raw glass

→ Liaison between transit points
→ Costs of shipping
→ Relationship with other cargoes

Secondary furnaces, vessel production

→ Construction and control of workshop
→ Access to raw glass and ?colourants
→ Fuel supply
→ Relationship with other industries
→ Development of specialist skills
→ Supply of specialist tools

Vessel finishing

→ Relationship between furnace workers and vessel finishers
→ Spatial arrangement between hot and cold working zones
→ Specialist skills and equipment

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Fig.7.1 Simplified model of the glass production chain from raw glass to finished vessel

This simple model does not cover all the pathways of production that may have co-existed, and variations occurred. Where secondary workshops were located next to primary furnaces for example, complex shipping and trading arrangements would not have featured. Alternative methods of vessel finishing where rims and decoration were formed during hot-working would have made a cold working unnecessary. Nevertheless, the model serves as a mechanism to relate the results from the data that has emerged in chapters 4-6 to the respective stages of production. These will be examined sequentially beginning with an appraisal of the output of raw glass from primary furnaces during the later 1st century A.D. It will be demonstrated that this period witnessed a surge in the amount of raw glass being produced to satisfy the requirements of an expanding market for glass. Following this there will be a survey of the activities of the secondary workshops which produced the vessels. It will be shown how this evidence supports a model for major growth in secondary workshops in the western provinces during the 1st century A.D. The final section will look more closely at workshop practices relating to changes in the colour, design and decoration of vessels.

7.2 Primary glass production

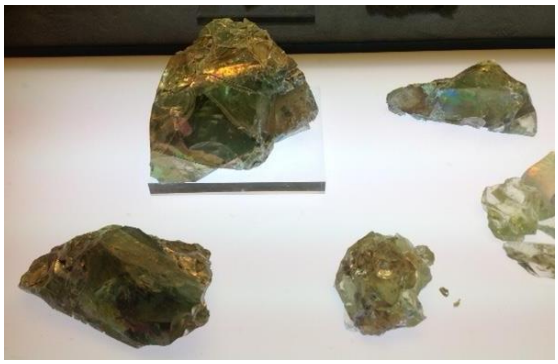
7.2.1 Review of recent work

Until about twenty years ago, it was generally assumed that the process of combining the raw ingredients of glass took place at a number of sites across the empire (see for example Fleming 1999, 138; Allen 1998 14-17). Contemporary references to early imperial glass production from raw materials are scarce, though Strabo alludes to glassmaking from sands on the Levantine coast, and to ingredients from Egypt and other unnamed locations:

‘Between Acre and Tyre is a sandy beach, the sand of which is used in making glass. The sand, it is said, is not fused there, but carried to Sidon to undergo that process. Some say that the Sidonians have, in their own country, the vitrifiable sand; according to others, the sand of every place can be fused. I heard at Alexandria from the glass-workers, that there is in Egypt a kind of vitrifiable earth, without which expensive works in glass of various colours could not be executed, but in other countries other mixtures are required’
Strabo, *Geography*, 16, 2, 25

During the 1990s the results from analytical projects on Roman, Byzantine and early Islamic glass were beginning to point to an eastern Mediterranean origin for the main raw material (the sand), in the overwhelming majority of vessels in use across the empire (Freestone, Gorin-Rosen and Hughes 2000, Foy and Nenna 2001, 32-33; Picon and Vichy 2003; Freestone 2005; Degryse ed. 2014; Freestone et al. 2015). As the long-distance shipment of sand to primary furnaces was considered highly unlikely, the only plausible explanation was the production of raw glass in the eastern Mediterranean and its subsequent transferal to secondary workshops, often over considerable distances. Further evidence that raw glass was being transported around the empire also came to light during the late 1980s and 1990s, in the excavated cargoes of shipwrecks. The earliest of these, dated to the late 3rd -early 2nd century B.C. is the 'Sanguinaires A' wreck, discovered off the west coast of Corsica (Alfonsi and Gandolfo 1997; Cibecchini et al. 2012). Other recently published finds include the cargo of blue/green glass blocks in the late 1st century A.D. wreck off the Croatian island of Mljet (Radić Rossi 2009 and 2012) (Fig.7.2.a), the raw colourless glass from the 2nd century A.D. Embiez-Ouest 1 wreck (Foy and Fontaine 2007) (Fig.7.2.b) and the unrecovered cargo of blue/green raw glass and glass vessels from the Cap Corse 2 wreck off the north-east Corsican coast (Fontaine and Cibecchini 2014). The Embiez Ouest and Cap Corse 2 cargoes are particularly interesting as they contained both raw glass and glass vessels, and also (at Embiez-Ouest 1), window glass.

a.



b.

Fig.7.2.a Glass from the Mljet wreck, b. Glass from the Embiez-Ouest 1 wreck

Further weight to this new scheme has been provided by excavations in Israel and Egypt from the 1990s onwards which uncovered evidence for primary furnaces producing huge quantities of raw glass. These include the large slab of glass from Bet She'arim (Freestone and Gorin-Rosen 1999) and the furnaces at Bet Eli'ezer (Gorin-Rosen 2000) both in Israel

and dated to the Late Antique and early Islamic period. Evidence of 1st century A.D. raw glass production has been proposed at Beirut (Kouwatli et al. 2008) and recent excavations near Haifa have uncovered the remains of a 4th century A.D. raw glass manufacturing site[5]. Large tank furnaces for the production of raw glass from the 2nd century A.D have also been located in the Wadi Natrun, Egypt (Nenna 2015). These installations produced huge quantities of glass. A rough calculation of the output of the two tank furnaces at Beni Salama in the Wadi Natrun puts the weight of glass from a single firing at between 13 and 22 tonnes, depending upon the thickness of the slab (see Nenna 2015, 14-15 for an explanation of the calculation).

A project to map suitable glassmaking sands around the Mediterranean confirmed this general picture, but did not rule out the possibility that smaller sand deposits further west might also have been used (Degryse ed. 2014). This possibility is strengthened by the detailed description by Pliny the Elder of the manufacture of raw glass on the coast of Campania between Cumae and Liternum, which also refers to other manufacturing sites in Gaul and Spain.

.. ‘at the present day, there is found a very white sand for the purpose, at the mouth of the river Volturnus, in Italy. It spreads over an extent of six miles, upon the sea-shore that lies between Cumæ and Liternum, and is prepared for use by pounding it with a pestle and mortar; which done, it is mixed with three parts of nitre, either by weight or measure, and, when fused, is transferred to another furnace. Here it forms a mass of what is called "hammonitrum;" which is again submitted to fusion, and becomes a mass of pure, white, glass. Indeed, at the present day, throughout the Gallic and Spanish provinces even, we find sand subjected to a similar process.’ *Plin. HN*, 66.

This reference, by a scholar who knew the region, should be given serious consideration, even though efforts to identify workshops in that area have as yet been unproductive. There is also tentative support from a recent analysis of isotopic data from vessel fragments and sand sources for some degree of western Mediterranean primary production (Degryse and Schneider 2008).

[5] See summary of recent furnace excavations at http://www.antiquities.org.il/Article_eng.aspx?sec_id=25&subj_id=240&id=4192

7.2.2 Quantities of raw glass production

All these findings have fired ongoing debates concerning the organisation of the industry. It seems clear that the supply chain in the production of glass was more complex than previously appreciated. Many questions remain unanswered, particularly concerning the amount of glass being shipped between raw glass suppliers and the secondary furnaces where glass vessels were being produced.

With only chance finds of shipwrecks and a limited knowledge of primary production sites it is difficult to draw a picture of the quantities of raw glass being dispatched around the Roman world in the 1st century, and equally hard to translate information about primary glass production into actual numbers of vessels being manufactured at this time. Despite this lack of precision, it is worth conducting a rough calculation based upon what we do know, if only to provide an impression, albeit imprecise, of the sort of numbers involved. To this purpose we can use some of the following measurements: -

- The furnaces at Beni Salama in the Wadi Natrun were calculated as producing between 13 and 22 tonnes of glass in a single firing (i.e.13,000-22,000kg)
- In the Mljet shipwreck, the largest glass blocks weighed about 2 kg, and the entire amount of glass recovered from the site weighed over 200 kg (Radić Rossi 2012)
- The recovered raw glass blocks from the Embiez Ouest wreck weighed 163 kg (Foy and Fontaine 2007, 243)
- Bottles vary greatly in size and weight; a very large hexagonal bottle (over 30cm high) from a burial at Kelshall in Hertfordshire weight at least 4kg. A smaller square bottle (21cm high) from the same burial weighed 600g
- A small cup weighs in the region of 45g (based on the weight of a complete replica mould-blown circus cup produced by the Roman Glassmakers[6])

On this basis it is possible to generalise along the following lines:-

[6] http://www.theglassmakers.co.uk/newgalleryroman/beakers/047a/047abluegreenlarge.jpg

- The furnaces at Beni Salama could in theory produce enough raw glass in a single firing to produce 3,250-5,500 large bottles or 21,600-36,600 small bottles, based on the Kelshall examples cited above, or about 290,000-490,000 cups of 45g each.
- The glass from the Mljet shipwreck (which may not have been the full glass cargo) would produce roughly 50 large bottles or 330 smaller bottles based on the Kelshall examples, or 4,400 cups.
- The raw glass from the Embiez Ouest wreck (again perhaps not the full glass cargo) would produce roughly 3,600 cups

These are very wide-ranging figures, and there are many factors that need to be taken into account when performing calculations of this kind. The furnaces of Beni Salama appear to have been active in the 2nd century A.D., but whether they were active in the 1st century, the frequency of furnace firings and the extent of the market for their glass remains uncertain (Nenna 2015, 18-20). Only very limited and speculative links have been identified so far between the glass from the Wadi Natrun and vessels from the western empire, with some antimony-decolourised vessels having a similar chemical profile to some of the raw glass analysed from the site (Cabart and Velde, 2009). It is thought most of the glass from Wadi Natrun probably supplied the Egyptian glass market (Nenna 2015, 19). The glass from the Mljet shipwreck does appear to be 1st century in date, but the recovered blocks may not represent the entire original cargo load and the later Embiez Ouest cargo may also not have been completely recovered. These figures do however give some impression of the sorts of quantities of glass that might be being produced and shipped.

Quantifying any increase in raw glass production precisely is not easy, and the claim relies on the general impression given from the size of assemblages recovered from 1st century sites, from the amount of glass used to produce certain larger sized vessel forms and the spread of glass use to populations in new provinces. Roman Britain for example, was a major new consumer of vessel glass. The incidence of vessel glass in pre-Roman Britain is very low for example, and yet within a few decades and by the end of the 1st century its level of use is comparable with that of other Roman provinces.

It is very difficult to determine accurately an increase in the actual quantities of glass used from the assemblages in this study. This is because all the sites have different patterns of

deposition, a different area footprint, varying methods of artefact retention and recording, and were excavated over a greater or lesser number of weeks, months or years (see Cool and Baxter 1996 for an explanation of some of the difficulties in quantifying glass usage).

Some of the best clues to the amount of raw glass becoming available however are to be found in the size and weight of some of the vessels being produced in the 1st century A.D. To a large extent these factors depend upon the form of the vessel, with large bottles and jars inevitably consuming more raw glass than smaller cups and beakers. Nevertheless, vessels comparable in size and general form can be produced using widely differing quantities of glass. The second half of the 1st century sees relatively generous amounts of glass being used in the formation of many standard vessel forms. Vessels tend to be rather sturdy, with some forms, such as non-blown ribbed bowls, using considerably more glass than would strictly be needed to produce a serviceable bowl. However, it is the bottles, produced in large quantities during the later 1st century, that most visibly indicate quite how much raw glass was available during this period. Bottles were produced in a range of sizes and large examples, 20-30cm in height or more, regularly occur in 1st century contexts (Price and Cottam 1998, 191-200). A good impression of the height of bottles of the period comes from the complete examples from Pompeii, which are rarely less that 15cm high, with many between 20 and 30cm. The generous amounts of glass used in the body and base (often around 5-10mm thick) and in the handles, suggest that there was no sense that glass needed to be rationed to any extent when making these early bottles. The quantity in which they were produced, often forming up to 50% or more of vessel assemblages in the 1st-2nd centuries, also demonstrates the abundance with which glass was being produced during this period. Bottles were widely adopted, being particularly popular on military sites. At Camelon for example they formed about half of the vessel assemblage, at Strageath 64.4% (Price 1989, 193) and at Elginhaugh the proportion was 75% of the total fragments (Price and Worrell 2007, 451).

To this we need to add the substantial increase in the use of glass in other parts of Roman life, particularly in the production of windows, which in the 1st century are of the thick matt/glossy variety. Glass windows were probably produced by pouring hot glass onto a flat surface and further flattening and manipulating it to produce a square or rectangular pane up to 3-5mm thick (Taylor 2001; Foy and Fontaine 2008, 408-30). The thickness of these early ‘cast’ panes means that a considerable amount of glass was used. Some well-

preserved panes from Aix-en-Provence have been restored up to 40-50 cm2 (Foy and Nenna 2001, 98) and even larger examples have sometimes been found, for example at the Red House fort baths, Corbridge (Charlesworth 1959a, 166). A recent calculation based on fragments from Barzan suggests that a pane of glass of about 40cm2 could weigh around 2kg. This would be the equivalent of around 45 cups of the 45g type discussed above. Whilst this is inevitably far from being exact, as panes vary in thickness from the edge to the centre, it does show that roughly 100 panes of that size could have been produced from the cargo of raw glass recovered from the Mljet shipwreck. Bath houses in particular are likely to have made extensive use of window glass for the retention of heat, as demonstrated by the calculations for the Baths of Caracalla in Rome, where 3,400m^2 of glass is estimated to have been used (DeLaine 1997, 218). Beyond their use in bath houses the number of windows being installed into public and private buildings is difficult to establish. Windows are rarely broken (early Roman windows being particularly thick and sturdy) and many survive for decades intact unless a building falls into neglect. A scenario where Roman windows may have been removed during building demolition and refurbishment for re-use elsewhere, therefore leaving no archaeological trace of their existence, has often been observed (Price and Worrell 2007, 455).

Nevertheless, it is highly likely that the surge in building activity in the 1st century A.D. would have seen a distinct spike in their manufacture. This period saw the construction of three large bath house complexes in Rome under Nero, Titus and Trajan (Fagan 1999, 110-114). A huge increase in the construction of major public and private buildings in the 1st and early 2nd centuries has been described in the case of Roman Gaul as a ‘building boom’ (Woolf 1998, 123) and is seen at many of the sites included here. The extensive network of new forts in Britain for example would all have included bath houses and administrative buildings likely to have contained window glass, and fragments have been found at nearly every fort, often in Flavian contexts, as at Inchtuthil (Price 1985a, 308, 312 no.14). At Barzan a major bath house and associated porticos, shops and other structures were constructed in the later 1st century and renewed in the early 2nd century A.D. (Bouet 2011).

The consequences of this expansion in the basic quantity of glass in circulation have not been subject of focussed discussion but have an important effect not only on the number but also the characteristics of the vessels produced. These issues will be discussed again

later in this chapter, and in Chapter 8 where the impact on the relationships between raw glass suppliers and vessel manufacturers will be explored as well as the wider effect on attitudes to the consumption of blue/green glass in respect to other colours.

7.3 Secondary furnaces

7.3.1 Review of recent work

Alongside research into raw glass production, the last three decades has seen a similar dramatic expansion in our understanding of the systems governing vessel manufacture (the secondary industry). In 1989 a conference organised by the Association Française pour l'Histoire du Verre brought together current knowledge of vessel-producing furnaces in the western provinces (Foy and Sennequier eds.1991). In France, 19 production sites dating from the 1st-3rd centuries A.D. were known or suggested, based upon the discovery of furnace remains, tools and wasters; fewer than ten of these identifications were based upon excavated furnaces (Foy 1991, 54-69). The latest review of sites now puts the total for France alone at 33 (Foy 2010, Fig.18). In Britain outside London, 11 sites were put forward as known or possible glassworking locations in 1989, a total that had risen to 21 in a 2002 review (Price 2002), with further sites added since (see for example the rural workshop at St Algar's Farm, Somerset (Tyson 2012). In London 13 sites were identified in 1989, a total now expanded to 25 (Shepherd 2015; Wardle et al. 2015, 97-110).

Current evidence indicates that secondary workshops could be based in urban, military and more occasionally rural locations. It is often difficult to gauge how long individual furnaces were in operation. A sustainable source of fuel would be crucial to the operation, but other aspects of the process are more flexible. Most obviously, glass vessel makers, unlike potters, do not need to be near the source of the raw material. Late Roman and early Islamic glassworking evidence from Israel suggests that vessel makers were generally located away from primary furnaces and nearer population centres (Gorin-Rosen 2000; Freestone et al. 2015), though recent discoveries south-east of Haifa may suggest that this was not always the case (Gorin-Rosen pers comm). We have already seen that raw glass travelled long distances to secondary furnaces, and furthermore there appears to have been a healthy supply of recycled glass fragments for at least some

producers (Keller 2004; Perez-Sala and Shepherd 2008). The equipment needed for glass workers includes some specialised elements (most notably the blowing irons), but many of the tools (pincers and shears for example, as well as wooden tools) are more generally available, and all are transportable. Secondary furnaces are relatively small structures (see Price 2002 for a short review), and it is as yet unclear whether ovens for annealing would have been attached to the melting furnace or separate from it. Either way, the construction of a glass furnace would have been a relatively straightforward process, using bricks and clay [7]. Given the relatively low technology needed to blow glass, several different models of production have been suggested. Some furnaces appear to have been used over a number of years, with evidence of reconstruction, as for example at Mancetter (Price and Cool 1991, 24), whilst others may have been in use for much shorter periods of time. In the 1st century A.D. some glassworking appears to have had a military connection, as glass waste has been found at several military sites (see below for a discussion of the evidence from Camelon and Nijmegen). The extent of army involvement or control over the activity is however unclear. Other furnaces have been found in the heart of established urban centres (as at Lyon and Avenches), where there are clear advantages in terms of trade connections and available markets. The placement of glassworking alongside other industries has also often been noted, as at London, Mancetter, Castor and Water Newton and Lyon (Wardle et al. 2015, 100; Price and Cool 1991, 24; Price 2002, 85; Robin 2012b, Robin 2012c). One other possible model proposed by Price (Price 1991a, 72-74) is the existence of travelling or peripatetic glassworkers, moving from one centre to the next as resources and markets dictate.

In the following sections, the development of the industry during the later 1st century will be examined in the context of data from contemporary workshop sites and some proposals put forward concerning their organisation and output (Sections 7.3.2-3). Workshop management of different colour groups (as presented in Chapter 6) will be discussed in Section 7.4 and in Section 7.5 changes in vessel form and decoration will be assessed.

[7] See http://www.theglassmakers.co.uk/archiveromanglassmakers/furnace2.htm and http://www.theglassmakers.co.uk/archiveromanglassmakers/furnace28.htm for a description of the construction of a Roman style furnace under modern conditions by David Hill and Mark Taylor.

7.3.2 1st century glass-working evidence in the western provinces

Considerable progress has been made in the last couple of decades in the identification of secondary glass furnaces across the western provinces, and several that were active in the 1st century A.D. have been excavated. The most significant are listed here, with a fuller description given in Appendix 2.

The identification of glass workshops relies upon a number of categories of evidence, not all of which are necessarily recovered during excavation (Price 2002, 83-85; Paynter and Dungworth 2011, 14-20). The principal types of evidence can be listed as:

- The remains of furnace structures (usually only preserved at ground level), either *in situ* or broken up and discarded
- Ceramic crucibles in which glass was melted to a working temperature
- Glass waste from the vessel making process, including residual glass from the ends of blowing irons (moils), melted drops and twists.
- Raw glass chunks and chips
- Collections of broken glass fragments brought together to be recycled (cullet)
- Tools and other equipment. Blowing irons have only very rarely been recognised, and not in early imperial contexts. Other iron implements have occasionally been identified. Moulds to shape bottles have been identified at several sites

Glass-working was identified at three or possibly four of the assemblages included in this thesis (Appendix 2, 1.1-4). Moils and other waste fragments came from Camelon, Nijmegen and Plantation Place, London and a further possible moil came from Waddon Hill. Also at Nijmegen, the large collection of fragments from the pits was interpreted as evidence for recycling (Isings 1980, 281).

Elsewhere, two sites in particular have provided detailed information on workshop practices in the mid-1st century. At Avenches in eastern Switzerland the remains of five furnaces dated c.A.D.40-70 were uncovered with associated glass waste including moils, chips of raw glass in a range of colours and fragments from vessels thought to have been made at the workshop (Appendix 2, 2.1). In Lyon, two workshop areas, La Montée de la Butte and the Manutention Militaire site both date to the 1st century Appendix 2, 2.2). At La Montée de la Butte (c.A.D.40-c.A.D.70) 16 furnaces were uncovered along with waste

material including charcoal, furnace debris, parts of a mould, waste glass and raw glass chips, again in several strong colours as well as blue/green. Two further sites in France have provided convincing evidence for 1st century glass working, though not *in situ* furnaces. At Reims, chips of raw glass in blue/green and strong colours, melted drops, pulled-out trails and twists, moils and other items of glassworking waste were found in an industrial area dating to the second half of the 1st century (Appendix 2, 2.3) and at Saintes debris from a glass workshop including parts of one or more furnaces, fragments of crucibles, sections of moulds, waste glass and an iron tool were found discarded in a well (Appendix 2, 24).

7.3.3 Location and working arrangements

Glass workshops are very difficult to date independently and accurately. Dating by the associated vessel fragments can only give a guide to the period of activity, as older material may have been gathered for recycling. A further complication lies in the identification of exactly which vessel forms are being produced by specific workshops. Again, the presence of fragments gathered for recycling can confuse the picture as can the practice of re-melting vessels that might have failed during manufacture. Despite the challenges in plotting the development of workshops and the vessels they might have been producing, a number of points can be made concerning the expansion of the secondary industry during the mid-late 1st century.

Very few of the secondary furnaces listed in Appendix 2 date to the early decades of the 1st century, with most appearing in the A.D.40s and later. This in itself points to an increasing dispersal of the industry in the western provinces from the mid-1st century onwards. It also begs the question as to where earlier vessels were being produced. The argument made by David Grose that there was major vessel production in Italy from the Augustan period (see Chapter 2.2) is not as yet strongly supported by the archaeological record and needs the confirmation of further fieldwork. But whatever the location of secondary furnaces in the first half of the century, the number of furnaces that can appear from the middle of the century onwards provides a strong argument for significant expansion of the industry in the second half of the century within Roman Gaul, Spain, Britain and the Rhineland. In Britain it is particularly telling that a furnace was operating in London within 15 years of its foundation (Appendix 2, 2.5). The development of new

urban centres and the expansion of existing settlements is likely to have encouraged glassworkers into the new province. As there is no evidence for vessel production in Britain in the pre-Roman period, the skills would have been imported, in contrast to ceramic production, where skilled workers were likely to have available amongst the existing population. It also implies an ability on the part of glassworkers to move locations (Price 1991a, 72-74), whether by their own choice as independent workers, or on the instruction of owners and patrons of slaves or freedmen.

The quayside locations of the glass workshops in Lyon and London may reflect a requirement for easy access to traded materials. The glass industry was reliant on the importation of its raw material and the collection of fragments for recycling, both of which would be easier in an urban environment. The urban and riverside location would also have provided both a local market and links to agents and traders within a wider distribution network. The other essential requirement for glassworking, fuel, would have been in demand for other heat-requiring industries – ceramics and metal working in particular. The furnaces at Lyon were close to other industries, including smaller potteries and metalworking workshops in an industrial complex where the mutual benefits of proximity could be exploited, including access to fuel supplies and the exchange and development of related skills such as furnace management, tool production and stone mould construction (see Cool and Price 1991, 24, 27 for further discussion). It is impossible to say whether groups of glass furnaces and workshops, such as those in Lyon and Avenches, formed recognised glassmakers zones (*vicus vitrarius)* attested for example in early 4th century Rome (*Regiones Urbis,* I, quoted in Trowbridge 1930, 131). The working arrangements within workshops are difficult to reconstruct, given the shortage of contemporary images or references to glass vessel production. The closest contemporary image of a working glass furnace, a scene on 1st century terracotta lamps found in Croatia, Slovenia and Italy (Price 2005a, 170-171 Fig.10.3), shows two named workers either side of the furnace. It would be unwise to assume that this balanced, miniaturised pictorial composition closely relates to actual contemporary workshop practices. Nevertheless, it is worth remarking that the scene shows two separate tasks being performed with one seated figure using a blowing iron, and a further kneeling figure holding either another tool or a completed vessel. The social status of the glass workers is unclear, though it has been suggested that the names mentioned indicate that they were freedmen (Stern 1999, 457). Literary and epigraphic evidence provides information

generally relating to later periods. A division of skills is implied by the terminology used in literary sources for the glassworkers, or 'vitrearii' as distinct from glass cutters, who come under the category of 'diatretarii' (see Trowbridge 1930, 66, 109-110, 112, 119). The relationship between these roles is discussed in Section 7.5.3. Individual glassmakers are occasionally named on later funerary monuments, such as that of the 3rd century A.D. glassworker Julius Alexsander at Lyon (Price 2005a, 176 Fig.10.9), but their roles in relation to workshop output are not specified.

Very little is known about specific Roman glassmakers, and this is particularly true in the 1st century A.D. There has been considerable debate about the significance of signed vessels particularly mould-blown pieces bearing the names Ennion and Aristeas (see Price 1991a, Lightfoot 2014). Signed glass vessels are very rare, in contrast to the incidence of name stamps on some contemporary ceramics, in particular samian vessels. This may largely be related to the nature of the medium, as stamping wet clay is eminently more achievable than impressing a name into a hot glass vessel. Mould-blown glass tablewares occasionally show a name and it is usually suggested that this relates to the owner of the workshop or the principal craftsman rather than the individual who specifically produced the mould or the vessel (Lightfoot 2014, 18; Price 1991a). In the assemblages in this study, two mould-blown vessels, square bottles from Usk and Xanten, have a base moulding with a specific name and reference to manufacture, reading 'Chresimus fecit'. Marks on containers such as bottles are more ambiguous and may refer to the proprietor of the workshop producing the contents of the vessel rather than the maker of the container (Foy 2017, 289). The 'Chresimus' marks appear quite early in the production timeline of prismatic bottles (see Cool and Price 1995 184-185 for a discussion concerning date), with the Xanten bottle almost certainly before A.D. 69 and the Usk bottle coming from a pre-Flavian latrine pit. The occurrence of a manufacturer's name on a bottle at this early date is interesting in that it indicates either a proprietorial concept within the secondary glass industry or a close connection between glassmaker and content producer.

Additional information can be derived from the excavated workshops, though even here the evidence is sketchy. The most sophisticated of the operations listed above would appear to be the Avenches workshop. Here, production appears to be focused on a particular category of vessel, flasks for cosmetics and unguent oils. A wide range of

coloured glasses were being used in combination with a number of decorative techniques. Some of the forms were produced in moulds, which may have been produced by the glassmakers themselves, or may have been provided by mould makers outside the industry, specialising in stone, ceramic or metalwork. A link with other crafts is suggested by the use of lead as a lining within some of the globular flasks of Isings form 10, which seems to have been applied as a liquid in a complex process during the production of the vessel. Perhaps the most intriguing connection highlighted by the Avenches excavations is the direct link with the supply of the cosmetic products themselves. At least two of the forms produced at Avenches, the globular and bird-shaped flasks of Isings form 10 and 11 were closed at the workshop, sealing the contents. This implies a rather more sophisticated enterprise than mere vessel manufacture. Here, a saleable product was being included with the vessel at source, with all the additional negotiation and costings that such a measure would incur. It is not clear from the evidence at Avenches whether the cosmetic products were produced within the same industrial area or were brought in from further afield. Nevertheless, the arrangement demonstrates that here at least, and at an early stage in the production of blown glass in the west, glassworkers were part of a sophisticated manufacturing network.

7.3.4 Scale of output

Whilst the amount of raw glass being produced in primary furnaces clearly has a significant bearing on the growth in the number of vessels being produced, it is the scale of operation of the secondary workshops, the point at which vessels were conceived and fashioned, that relates most closely to changes in vessel form and decoration. The overall impression from the workshop sites listed above is of small to medium scale production, at most two or three furnaces, grouped together in small workshops. Many of the sites were revealed during urban excavation, and therefore the true extent of these workshops is not always apparent. Nevertheless, there is a sharp contrast between these small 'artisan' style activities and the large-scale industrial complexes associated with some contemporary ceramic industries, most notably samian production (Marichal 1988; Webster 1996 9-12). Clearly when compared with ceramics, glass assemblages on 1st century sites are relatively small, even when the practice of recycling is allowed for in quantifications. Despite the bulk manufacture of raw glass, as a material it could never compete with the availability and abundance of clay. By every measure of quantification,

pottery assemblages dwarf those of glass at the sites studied here. In the early Roman phases at Leadenhall Court, London, for example, the ceramic assemblage was calculated at 38,444 (estimated vessel equivalents) whilst the glass totalled 1,884 (Groves 1993, 114-5; Shepherd 1993, 99). A fragment for fragment comparison of glass and ceramics in the well at Barzan, where there was no indication that glass had been collected for recycling, put pottery at 13,064 sherds and glass at 1,126 (Sanchez 2011 395-396 Fig.44; Cottam 2011 532 Fig.5).

A model of dispersed, largely urban based workshops, working either as single entities or in small clusters can correspond with the varied repertoire and relatively small share of glass tablewares in consumption assemblages. Even so, there is a sense of mismatch between the quantity of bottles being recovered from later 1st century sites and our existing knowledge of secondary furnaces. Bottles were produced in the hundreds of thousands from the mid-1st century A.D. onwards (see Chapter 5.3.5), yet there is only limited evidence for their production at 1st century workshops.

Possible production of bottles has been occasionally identified at excavated workshops by the presence of stone moulds, as at Saintes and Lyon (Hochuli-Gysel 2003, 184-5, 189, figs.11-13; Robin 2012c, 187-8 Fig.7) but the impression given is of a relatively small scale, dispersed production model where bottle manufacture runs alongside that of other forms rather than as a specialised enterprise. Sixteen bottle moulds, the largest single collection known from the Roman period, came from a 2nd century A.D. industrial building in Apulum in Dacia (Romania), but the period over which they were used, and the size of the associated workshop is unclear (Pánczél 2011). If large-scale, possibly dedicated bottle production centres were in operation in the western provinces, then they are yet to be identified. However, as the current lack of glass workshops in 1st century Italy demonstrates, there are clearly huge gaps in the data and many workshops must remain to be discovered.

Whilst glassworking has been noted at military installations there is no evidence of any official link between glassworkers and the army at this point. Camelon is certainly an interesting case in that signs of vessel manufacture are apparent in the Flavian phase of the fort, but the nature of the relationship between the glassworkers and the military is unclear. The vessels identified as possible products of the workshop are drinking vessels

rather than the utilitarian bottles which are found in such large quantities on military sites. The Camelon glass workshop was probably responsible for a relatively limited number of vessels and may have simply re-processed glass broken during the lifetime of the fort (Price and Cottam forthcoming).

7.4 Colouring vessels

The data presented in Chapter 6 confirmed a general reduction in the use of polychrome and strong colours during the second half of the 1st century whilst at the same time demonstrating that these changes were not necessarily concurrent or universally observed. Not all strong colours declined at the same rate and some stayed in use for certain forms whilst going out of general use, as was the case for example with dark green (see Chapter 6.2.3). It was also argued that colourless glass vessels were produced in small quantities compared to the earlier output levels for strongly coloured glass (see Chapter 6.3), arguing against existing proposals (presented in Chapter 1.1.2) that colourless vessels took the place of strongly coloured wares in the glass repertoire. Furthermore, the range of forms being made in colourless glass was much narrower than had been the case for strongly coloured vessels (see Chapter 6.2.6 Fig.6.10). Whilst the furnace sites linked to 1st century production discussed above are not as precisely dated as the assemblages that provided the data for Chapter 6, the potential of the more extensively excavated examples (notably Avenches and Lyon) to provide additional clues concerning colour exploitation will be examined here.

The point during production at which glass was coloured is an important part of this discussion. Glass was coloured by the addition of a variety of minerals to the basic glass recipe and the manipulation of furnace temperatures. Decolourisation was also achieved by the addition of manganese or antimony-based agents (see Fleming 1999, 137-144 for a brief overview of colour creation). If colour was added at primary production (or during a supplementary stage between primary manufacture and vessel production) then the skills and ingredients needed to obtain consistent and reliable colour would have been required at the earliest phases of manufacture and the glass would have arrived ready-coloured to secondary workers. If on the other hand glass required colouring on arrival at the secondary furnaces, then a knowledge of the techniques of glass colouring and access

to the ingredients to produce colours would have been required by the workforce in addition to their skills in furnace management and vessel production.

The answer to whether colouration of glass was undertaken in the primary furnaces, either during initial fusing or soon after, or was conducted during secondary working is uncertain, (Rehren and Freestone 2015, 235-36; Boschetti et al. 2016, 304) though some analyses point to primary site colour production as the most likely scenario (Boschetti et al. 2017, 655). The discovery of coloured and de-colourised blocks of raw glass in the shipwrecks at Les Sanguinères and Embiez Ouest 1 (Fig.7.2.b) suggests that for some glass at least colour was being manipulated at source (Foy and Nenna 2001, 24 & 29 figs.3 & 12; Foy and Fontaine 2007).

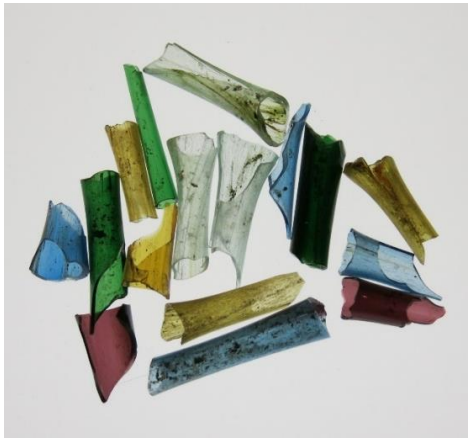
In Strabo's early 1st century A.D. observation about industry in Rome it is unclear whether the 'inventions for producing various colours' relate directly to glass manufacture or more generally to the production of pigments, but they may imply that some colouration was taking place in a secondary phase of glass production.
"..at Rome, it is reported, there have been many inventions both for producing various colours, and for facilitating the manufacture, as for example in glass wares, where a glass bowl may be purchased for a copper coin, and glass is ordinarily used for drinking." (Geog.XVI, 25)

Intriguing findings have also come from a recent analysis of a collection of 2nd century A.D. glass tesserae and two cakes of opaque glass from West Clacton in Essex. The authors suggest that 'all of the copper-coloured turquoise glass, including the turquoise cake and three turquoise tesserae were probably made using *recycled* (my italics) Sb-Mn glass as a base' which by implication means that the colouring of this glass did not take place at the primary manufacturing stage (Paynter et al. 2015, 71).

Colouring and decolourising glass may in reality have taken place at either or both the primary and secondary stages of production. However, there is no evidence at secondary workshops dated to the 1st century for on-site colour production. The presence of raw glass chips in a range of strong colours argues in favour of blocks of glass being brought to the site ready-coloured. At the sites that appear to have been operative in the mid-1st century, such as Avenches and Lyon, a range of strong colours appears to have been in

contemporary use. Raw glass and glass waste in dark green, dark blue, purple and yellow/brown were found at both sites alongside natural blue/green glass (Fig.7.3.a-c). At Avenches, where workshop output appears to have focussed on small flask and unguent bottle forms, the debris from broken vessels shows no particular correlation between particular forms and individual colours. Small mould-blown flasks for example were being produced in all the strong colours as well as blue/green glass (Fig.7.3.d).


a


b

c


d

Fig.7.3 a. Raw glass, b-c. Production waste, d. Vessel fragments from Avenches, Switzerland (photographs courtesy C .Jackson)

At none of the furnace sites listed in Appendix 2 is there any indication that high quality colourless glass was being used alongside strong colours. The workshops at Avenches and Lyon may have gone out of use before colourless glass became a feature of vessel production from the A.D.60s and 70s onwards, but on the current evidence seems that strongly coloured and colourless vessels were not produced side by side within the same workshops. Nor is there any suggestion that workshops moved into colourless production, having previously made vessels in other colours. At Nijmegen, a small quantity of

colourless glass waste was found along with naturally coloured debris, which may indicate that here at least it was part of the repertoire (Isings 1980, 324-325, Fig.30 nos.7-14). However, none of the workshops listed provides evidence for the production of the most distinctive of the early colourless vessels, such as facet and relief-cut beakers and wide rimmed colourless plates and bowls.

It was noted in Chapter 6 that even amongst some of the strong colours in contemporary use, there were instances where certain colours were avoided in the production of particular forms. The cases cited included the avoidance of dark green in the production of monochrome non-blown ribbed bowls (Isings form 3), blown ribbed bowls (Isings form 17) and most jugs (Chapter 6.2.3) as well as the absence of purple mould-blown sports cups (Chapter 6.2.4). The examination of the waste material from the Montée de la Butte site in Lyon provides a little further insight into this phenomenon. Here, dark green raw glass chips and production waste was found amongst the full range of other translucent strong colours (Robin 2012b, 50, Fig.27, 54-5 Fig.29). Amongst the forms identified as part of the repertoire of the workshop were those frequently produced in dark green (e.g. Isings form 12 and 44) as well as others (eg. Isings 3 and 17) that were never produced in that colour (Robin 2012a, 61-72 Fig.38). Here then it seems that forms never associated with dark green were being produced at a workshop where the production of dark green vessels was clearly taking place, suggesting that although the colour was available, it was for some reason not chosen to produce certain forms (Cottam and Jackson 2018, 100-102). However, it is not certain that all these forms were in production simultaneously, as establishing what constitutes exact contemporaneity at a glass production site is an almost impossible task. Whilst glass-making debris of different colours may be deposited together, it is possible that consignments of raw glass in different colours were acquired at different points in the lifetime of the workshop and correspond with phases in vessel output. The supply of coloured and colourless and blue/green glass and its implications for the relationship between traders and glassworkers is explored further in Chapter 8.

7.5 Vessel finishing and decoration

7.5.1 Rim and base formation

Aside from the major changes in the colour range used in the production of glass, other developments in glass manufacture have been identified as being associated with the mid-late 1st century industry. In Chapter 5, a number of changes in rim and base formation were identified, including the increased use of fire-rounded rims and the formation of small tubular bases on cups and beakers (Chapter 5.3.2).

The production of tubular bases requires no supplementary tools to those found in the basic set of equipment used by hot glassblowers, such as pincers. In the list of workshops above, only the sites at Saintes appear to have produced vessels with this type of base. Here the bases formed part of conical beakers, produced in blue/green and greenish glass with a cracked-off rim and applied trails in loops on the body (Hochuli-Gysel 2003, 184-191 Fig.18 no.4). This form has been recognised throughout France but appears to be particularly prevalent in the south west, being noted at Soulac-sur-Mer (op cit. 185), at Barzan where at least five came from the well deposit (Fig.7.4), at Rom (Dubreuil 1995, 141, 148-149, nos.23-25 Fig.8) at the villa of Plassac (Hochuli-Gysel 1990, 47, 70 no.58) and sites in Bordeaux (Simon 2006, 34, Fig.6 no.32; de Pury-Gysel 2007, 89 nos.30-32 pl.3). As noted in Chapter 5 however, the production of tubular bases does not appear to be linked exclusively to a single form of cup or beaker, being used on both high quality colourless vessels as well as more poorly finished examples.


Fig.7.4 Looped trails from Barzan.

Fire-rounded rims, whilst very occasionally known on some mid-century forms (most notably cups and bowls with handles such as the blown cantharus and scyphus forms of

Isings 38 and 39), were particularly common on blue/green cups or beakers with out-turned rims and cylindrical or convex bodies from Nijmegen and Barzan. The fact that vessels with fire-rounded rims were found in such huge numbers of the pits in the eastern *canabae* at Nijmegen in particular, may indicate local production, perhaps in the *canabae* itself, where glass-working debris was found. (Isings 1980, 282 Fig.1). In a situation where more sophisticated means of grinding the rim were unavailable, the simple rounding of the rim in the heat of the furnace may have provided a local solution to finishing the vessel. Evidence from two other sites may also suggest that heat finishing of rims could be linked to local production. As noted above, several cups from the Scottish fort at Camelon, including two from Flavian contexts, are finished in this way and show signs of being local products. Blue/green cups with fire-rounded rims, similarly poorly made, were found at the contemporary fort at Elginhaugh. These forms do not seem to be widespread and have not been noted with any frequency at other late 1st-early 2nd century sites. This limited distribution may in itself point to a more localised system of production or trade in these vessels.

Ground and polished rims, which continued to be used throughout the 1st century and into the 2nd century and beyond, are crafted after the vessel has cooled and represent a distinct stage in vessel production away from the furnace. At none of the glassworking sites above is there any evidence of tools or equipment that might be involved in cold rim finishing, such as rotary wheels or hard grinding materials. The significance of the increase in heat-finished rims in certain location is intriguing and may be symptomatic of an increasing regionalisation and localisation of the industry where workshops were established by glassworkers fully able to produce finished vessels at the furnace without the accompanying skilled glass polishers associated with more established glassworking operations. It may also add further weight to the suggestion that some glassworkers may moved between locations, producing vessels according to local demand. The availability of equipment, materials and skills might be more limited in this scenario.

Ground rims are frequently associated with linear cutting (the wheel-cut cups of Isings form 12 being the most common example), suggesting a strong link between the skills and equipment used in rim finishing and those used to produce cut decoration. Only very occasionally are vessels with heat-finished rims decorated with linear cutting; the blue/green beaker from Barzan (Fig. 7.5) is one such unusual example.

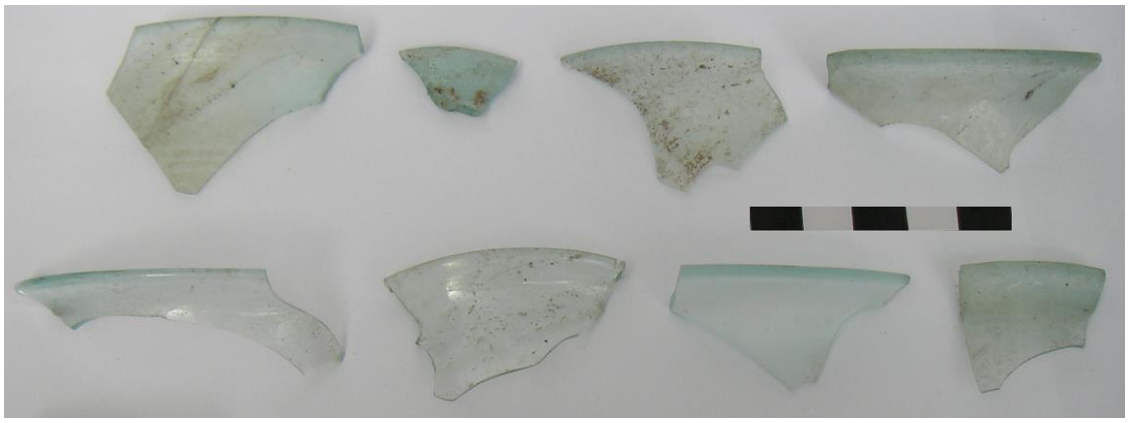


Fig.7.5 Fire rounded rims from Barzan, including, top left, beaker with horizontal cutting

7.5.2 Decoration

Whilst decorated vessels were being made in several of the workshops listed in Appendix 2, there is again no evidence for tools or equipment that might be used for this purpose in either the hot or cold-working stages. The creation of hot-formed decorative features such as ribs and trails are in the hands of the glassblower and would again not have required anything more than a basic range of tools such as pincers and shears. The thin pulled out trails found amongst the debris at Saintes were interpreted as waste from trail production and linked to the looped trails seen on the conical beakers also found in the deposit. Vessels with decoration formed whilst hot, such as small ribbed bowls with trails (Isings form 17) and the trailed beakers from Saintes quite often have cracked-off and ground rims. The evidence from the Saintes workshop suggests that here at least skills in both the addition of hot decoration (trails and blobs) and in cold rim-finishing were practised in the same workshop, as fragments of beakers with both hot-worked decoration and cracked-off and ground rims were found in the assemblage (Hochuli-Gysel 2003, 191 Fig.18 no.4). The beakers of similar form with cracked-off rims from nearby Barzan however were notable for the relatively poor finishing of the rims, many of which were uneven and poorly polished.

An entirely different set of skills to those involved in hot glass production is required to produce ground and polished decoration [8]. As noted above in regard to rim polishing, no equipment that can be securely recognised as relating to cut decoration has been identified from glass workshops. Whilst it is feasible that the cutting and finishing of glass vessels were undertaken at a different location from the initial hot working, certain aspects of the finished decoration suggest that there may be close links between those workers producing the vessel form at the furnace and those finishing the cold vessel. One such example is the nature and arrangement of motifs on facet and high-relief cut beakers, discussed in the following section.

7.5.3 Complex cut decoration

In his introduction to cut and engraved glass vessels in the monograph for the 1987 Glass of the Caesars exhibition, Donald Harden described the origins of glass cutting techniques as lying within the existing traditions of gem cutting (Harden 1987, 179-80), a view also supported by other commentators (von Saldern 1991; Vickers 1996). Early imperial cameo-cut glass vessels certainly show strong stylistic links with contemporary figure-cut agate and sardonyx gems (Henig 1983, 155-56; Fleming 1999, 29-30). Von Saldern also highlights the stylistic connections between glass vessels with high relief cutting and luxury vessels in other materials, particularly silver and semi-precious stones and illustrates direct comparisons in some of the motifs used. Whilst he acknowledges the difficulty in closely dating these vessels, many of which are now in museum collections, he says that it can be assumed that 'workshops manufacturing the *Hochschnitt* vessels borrowed heavily from products coming from (neighbouring?) ateliers specializing in precious metals and semi-precious stones' (von Saldern 1991, 117). The most complex style of glass cutting however, close-set facets, appears to be particular to glass.

Glass-cutting sits apart from other forms of glass decoration in that it is a separate undertaking, performed on cold vessels and involving entirely different skills from those required for glass vessel forming at the furnace. However, although the processes may be distinct, a certain amount of communication between hot and cold glassworkers must

[8] A discussion of the process of polishing replica non-blown vessels by Mark Taylor and David Hill illustrates some of the skills and equipment needed to finish cold vessels http://www.theglassmakers.co.uk/archiveromanglassmakers/nl2text.htm

have existed, as the blown blank would need to be of an adequate thickness to be successfully worked on the cutting wheel and of a sufficiently high-quality colourless glass to merit specialised cutting.

As very few other vessel forms were being produced in colourless glass at this time, there is clearly a close link between the high-quality decolourised glass that began to appear in some quantity in the A.D.60s and these particular beakers. This raises two interesting questions; firstly, whether there was communication between the vessel makers and the primary raw glass producers to the point where colourless glass was being produced deliberately and almost exclusively for these workshops; secondly, whether workshops already specialising in high quality cut decoration in other materials, for example gems or rock crystal, saw the opportunity to diversify into the production of highly decorated vessels in glass as colourless glass generally became more available. The processes involved in making facet and relief-cut beakers were highly specialised and vessels were passed from one task to the next until the process was completed. A division into individual specialisms is implied by the names noted above that were used for different types of glassworker (Section 7.3.3) and this separation of skills is also demonstrated in other craft areas (Hawkins 2016, 86-93). Whether a hierarchy amongst the various collaborators existed in these arrangements and whether artisans operated as independent contractors is not clear.

These questions are complex and difficult to answer in our present state of knowledge about the primary and secondary industries. As is discussed in Chapter 6, it is still not certain whether some glass was coloured (or decolourised) during further stages of production. Consequently, the proximity of the decolourising stage and the production of these vessels is unknown. Nor is it known where these vessels were made, whether near the sources of raw glass or in other provinces of the empire, nor how many workshops were engaged in their production.

These vessels have a very wide distribution, from the north-western provinces and beyond the empire's borders into Scandinavia, to the eastern provinces and beyond. Oliver argued for an eastern provenance for the type, citing similar painted vessels from Egypt, and also to the presence of Greek on a painted beaker from Bagram, Afghanistan and a colourless conical beaker with a relief-cut chariot racing scene from Caerleon (Oliver 1984, 39

Fig.12). The possibility of Egyptian workshops has also been proposed by Nenna, (Nenna 2003, 359-361), noting the availability of colourless glass in Egypt.

The appearance of facet and relief cut vessels marks a distinct new direction in the production of high-quality glass. For the first time, colourless glass was being manufactured in sufficient quantity to feed a specialised secondary industry engaged in the production of a monochrome colourless blown vessel form. Communication between the primary production of raw colourless glass and these secondary workshops may have been closer than for other colour groups, as the vessels were produced to specific criteria with decorative features that exploit the special characteristics of water-clear colourless glass. A possible correlation between antimony-decolourised glass, such as is used for facet and high-relief cut vessels, and raw glass produced in Egypt has been proposed (Nenna 2007, 130-131; Degryse ed. 2014, 106, 116; Gliozzo 2016), which might add weight to Oliver's argument that they were produced in Egyptian workshops.

It is clear that in the first stage of production of these vessels, the formation of the blown 'blank', the hot glassworker was aware of the need to blow a gob of glass of sufficient thickness to withstand deep cutting into the surface and allow the cutter to grind away the surface to leave prominent cordons and a base ring. Whether the initial production of the blown blank took place at the same location as the subsequent cutting is difficult to establish. However, the arrangement of the decoration on the indented and facet cut beaker from Xanten (Fig.8.2.b) points to close communication between the furnace worker and the cutter. Here the indents would have been produced during the initial production of the vessel, whilst it was hot. Sufficient space was maintained between these indents to allow facets to be cut between them once the vessel was cold suggesting that the design was planned at an early point in production. Andrew Oliver points to the existence of a small group of similarly shaped colourless vessels with painted decoration to support a linked production chain, noting the complex decoration on a beaker from the Benaki Museum in Athens which has both facets and enamelled decoration (Oliver 1984, 38-39 Fig.11). Oliver suggests production could have seen blank, partially finished vessels being given 'preliminary tooling' before being passed to a specialist decorator – either a glass cutter or enameller - for final finishing (Oliver 1984, 38).

7.6 Summary

Despite the general paucity of evidence for glass vessel production in the mid-late 1st century A.D., there are several points that can be made concerning the development of the industry during this key period. Firstly, whilst the number of secondary furnace sites is still quite small, there is a huge increase from the isolated examples of the first half of the 1st century. From the mid-1st century onwards there appears to be a distinct upturn in the number of new furnaces being built not only in established centres such as Lyon and Saintes but in emerging provincial towns such as London and in association with new military foundations such as Camelon. It is hard to judge the scale of these workshops, as not all the furnaces within them were necessarily functioning simultaneously, and some have only been partially excavated. Some appear to be quite sophisticated in the range of vessels being produced. At Lyon for example it is thought that non-blown, blown and mould-blown vessels are all included in the repertoire. Similarly, a high level of complexity and skill in vessel decoration is apparent in the production of many of the forms such as the non-blown ribbed bowls (Isings form 3) and ribbed and trailed cups (Isings form 17) which are believed to have been produced at Lyon. Other workshops appear to focus on simpler blown forms, and this is noticeable particularly at Camelon and Nijmegen, where undecorated cups and bowls with fire rounded rims were produced.

Most of the sites were producing vessels in more than one colour, and at Avenches, Lyon and Reims a range of strong colours as well as blue green glass appear to have been in contemporary use. Workshop specialisation in individual strong colours does not appear to have been practised. None of the excavated furnaces has produced evidence for colourless vessels, though for some this may be because they were operative before colourless vessels were in production. Whilst moulds for bottles were found at Lyon, Saintes and elsewhere, there is no evidence of large scale production of bottles at these sites, a significant lacuna, given the quantity in which they were produced (Fig.5.14).

In many cases glass workshops appear to have been established in industrial zones, often within or on the outskirts of urban centres. Evidence for collaboration with workers in other materials comes from the use of stone moulds and in the case of the flasks from Avenches, possibly metal moulds. There is also some evidence for the relationship

between the producers of glass containers and the manufacture of the products placed within them. At Avenches and possibly Reims, cosmetic products appear to have been put into glass containers at the site before sealing.

These lines of thought point to an industry in the process of expansion, with new workshops being established within a short period of time across the western provinces, producing high quality elaborately decorated vessels as well as simpler functional forms. In some cases, it appears that these different categories of vessel were being produced in the same workshops. A number of questions arise from the evidence presented here. Firstly, it is worth considering whether glassworkers at these multi-form production sites worked across the full range of forms and techniques, or whether specialisation within the workshop was practised. It is also possible that vessel production changed focus from one form to another depending on demand. Whilst many of the workshops discussed here may have been established over a number of years in a single location, a further model whereby glassworkers moved from one centre to another exploiting the resource of recycled glass is worth consideration. It is also perfectly possible that both modes of employment were practised. In the following chapter, these ideas will be explored in the context of the wider economic, political and social trends of the mid to late 1st century A.D.

Chapter 8
Glass as a Reflection of its Time

8.1 Introduction

8.1.1 Scope of the discussion

In chapters 5-7, glass vessels and the processes by which they were produced were discussed largely within the confines of their own material category. Chapter 8 will broaden the scope of the analysis, placing glass within an expanded framework, referencing other artefact groups and examining how developments in the wider Roman economy may have influenced the glassmaking process. It will begin by summarising some of the main changes identified in the previous chapters and examining whether they can be seen as truly originating at this specific time, or if they should be considered as building on existing attributes and trends within the glassworking tradition which show an escalation in the second half of the 1st century A.D. This discussion will help to clarify whether specific contemporary innovations within the industry lie at the heart of the changes observed, or whether forces external to the glassmaking process may have exerted an influence to promote or devalue established technologies and skills.

The chapter will then move on to consider to what extent changes in glass reflect prevailing moods and tastes in the wider Roman world. The discussion will examine whether considerations beyond the practicalities of the production/distribution chain might have been relevant, the second half of the 1st century being a time noted for political fluidity and territorial and economic expansion. The possible repercussions of contemporary historical events, such as periods of conflict and the rise and fall of ruling dynasties that may have influenced both the economic and cultural structures in which the glass industry operated will be assessed. Comparisons will be made with other media to assess whether similar tendencies in form, colour and decoration occur elsewhere or whether glass followed a more independent developmental path, reflecting the specificity of its particular production chain.

Teasing apart the forces behind these changes presents a complex challenge. There can be no simple answers to developments which may result from phenomena acting singly

or together, some sharing a common foundation with other production processes, others linked to craft development within glass making. No phenomena can be assumed to have acted across the full range of vessel forms, as different functional groups (such as luxury tablewares or storage vessels) may have responded to separate conditions and requirements. Therefore, to consider glass as a homogeneous group may be misleading. This chapter explores some of these complex models and proposes new approaches to understanding the context of glass development during this period.

8.1.2 Innovation and evolution: summary of the trends identified in chapters 4-7

Observations derived from data in Chapter 4 and analysed in more depth in chapters 5-7 identified a number of general trends in the production of glass. The most significant can be summarised as follows:

- Decrease in strong colours, notably dark blue, purple, dark yellow/brown and dark green (Chapter 6.2.2-5)
- Decrease in polychrome decoration (Chapter 6.2.8)
- Increase in the use of colourless glass for drinking vessels (Chapter 6.2.6)
- Increase in the use of naturally coloured glass (Chapter 6.3)
- Disappearance of most but not all non-blown forms (Chapter 5.2.1)
- Decrease in many cup forms and increased diversity in beakers (Chapter 5.3.2)
- Increase in the number of bottles and to a lesser extent, jugs (Chapter 5.3.4, 5.3.6)
- Increased use of heat finishing to form vessel rims (Chapter 7.5.1)
- Increased use of complex cutting in vessel decoration, seen particularly in colourless beakers with high relief and facet-cutting (Chapter 5.3.2)

Fleming, writing about developments in glass, identified three factors that produced ‘tension’ on glassworkers and influenced their work. He identified these as ‘historical events, technical innovation, and fashion and taste’ (Fleming 1999, 3). Taking the second of these points, it could be argued that whilst the developments listed here demonstrate a profound change in the appearance of glass, none can be described as representing entirely new innovations in glassworking technology.

The most significant innovation for glassworkers, the adoption of blowing, was already a mainstream practice by the mid-1st century A.D. and the information from this thesis suggests that blown vessels already formed on average over 65% of assemblage totals by

the mid-1st century (Fig.5.1). Whilst there may have been a slight acceleration in uptake around the decade A.D.65-75 this sits against a background trend of steady increase over an extended period. Larson's rigorous deconstruction of the earliest phase in the manufacture of blown vessels has led her to propose that the invention of blowing did not in itself prompt a sudden expansion in glass production from the mid-1st century B.C. onwards, but rather that the adoption of the technique should be seen in the context of an already booming industry, with the eventual dominance of blown glass being a gradual process due in part to the fact that blown techniques allowed for the formation of a much wider range of vessel types, particularly larger closed vessels such as flasks jugs and bottles (Larson 2016, 361, 365-367).

The shift in colour preference represents a decline in the colours afforded by existing knowledge of colourants and towards naturally coloured glass and is again not a reflection of the introduction of new techniques. The only 'colour' to increase its representation - colourless glass - is no new invention, but a re-introduction, having previously been used in Hellenistic vessel production, although it had been reduced to a minor component in a limited range of polychrome vessels by the first half of the 1st century.

Other developments in vessel form and finishing are also not new. Rounded rims for example, were present on a limited number of vessels in use before the mid-1st century, usually those with handles, such as blown scyphi and canthari. Complex cutting, whilst previously uncommon, was used in the decoration of some earlier highly luxurious items such as cameo vessels. This being the case, it is not specific technical innovation within the glass industry that is being witnessed here. The following sections will consider possible influences from outside the glass industry as well as factors concerning the organisation of production which produced a vastly different aesthetic in a matter of 20-30 years.

8.2 The historical and political context

8.2.1 Civil war and regional revolt

Fleming's first 'tension' upon glass production relates to the influence of historical events, and the decades from A.D.60 to A.D.80 certainly witnessed a series of well

documented and frequently archaeologically detectable upheavals. This sequence of violent and destructive episodes, including the Boudican revolt, the civil war and the Vesuvian eruption, is the very reason many of the assemblages in this study are dated with such accuracy.

Some of the most profound changes at the centre of the Roman world stem from the political upheaval of A.D.68-9. The Julio-Claudian dynasty, in power for a hundred years, came to an end with the death of Nero in A.D.68. The chaotic year of political infighting that followed saw two major battles in northern Italy, a region often identified as a major producer of glass vessels (Fleming 1999, 18). There were also uprisings in Gaul, involving Lyon, where glass workshops were already established (7.3.2), revolts cited as having a possible negative effect on parts of the ceramics industry (see 8.4.4 below).

Suetonius mentions political retribution in the form of 'heavy taxes' imposed by Galba on cities in Spain and Gaul that were reluctant to support his bid for power (*Suet. Galb.*, 12). Tacitus also notes that 'Galba too had taken advantage of his displeasure to divert the revenues of Lyon into his own treasury' (*Tac. Hist.,* 1, 65). It could also be argued that commercial disruption arising from the uncertainty of the time would have a particularly adverse effect on a product such as glass that relied so heavily upon an extended trans-empire trade network. However, whilst these events might have a temporary effect on the transport of raw glass and finished vessels, it is difficult to argue that they would have had long-term consequences on the colouring of raw glass – which as we have seen is likely during this period to have been at source, in the eastern Mediterranean.

Given its much closer location to the centres of raw glass production, the effect of the first Jewish revolt of A.D.66-73/4 on industrial activity in that region is worth consideration. The primary contemporary chronicler of the events, Josephus, describes the devastation of Judea and massive loss of life, particularly during the siege of Jerusalem, which, he says, killed over a million, including people from the city and those from the surrounding area who had gathered there for Passover (*BJ*, 6, 1, 1 and 6, 9, 3). Whilst the death toll as given by Josephus is generally regarded as an over-estimation of the actual numbers (Schwartz 1984, 23-5), it is certainly possible that eight years of revolt and loss of life might have disrupted regional industries, though the theory remains very

difficult to identify archaeologically. In the case of glass, it could be argued that supplies of certain raw materials, such as mineral colourants, might have been interrupted, though it would be unlikely for such a wide range of colourants to be equally affected in this way. Josephus also mentions the compulsory sale of land in Judea in reprisal for the uprising, and it is possible that in some cases this related to commercial or industrial properties (*BJ* 7,6,6). Grose touches on the destruction of craft industries in the region during the Jewish Revolt as a potential contributing factor in the sudden decline in the production of mould-blown tablewares (Grose 2017, 101), but there is currently no evidence for a specific impact from the revolt on raw glass production.

8.2.2 Dynastic change

The civil war of A.D.69 saw the installation of a new imperial family, marking the end of nearly a hundred years of Julio-Claudian rule. The arrival of the Flavian dynasty coincides with the period when a number of the changes in glass begin to be seen clearly, particularly the introduction of colourless tablewares and the drop in polychrome glass (6.3). The rule of Vespasian was promoted by contemporary chroniclers, notably Tacitus, as marking a change in tone from what he painted as the extravagance and moral depravity of Nero. The dismantling and re-purposing of Nero's Domus Aureus is one of the most symbolic expressions of this trend. Tacitus in particular points to an ostentatious austerity on the part of Vespasian himself. As a general on campaign he says:-

'His food was whatever chance offered; in his dress and bearing he hardly differed from the common soldier.' (*Tac. Hist.,* 2, 5)

More significantly, Vespasian having gained power, is seen as pushing his own austere moral code onto elite Roman society, who (rather willingly according to Tacitus) were prepared to follow his example:-

'But the main promoter of the stricter code was Vespasian, himself of the old school in his person and table. Thenceforward, deference to the sovereign and the love of emulating him proved more powerful than legal sanctions and deterrents. (*Tac, Ann.*, 3, 55)

This reference to an adoption of more restrained tastes is intriguing, though the focus on the person of Vespasian as one of the agents of this change may owe more to biographical embellishment than reality. Whilst Vespasian may have been the object of an idealized

portrayal of traditional virtues, the building of the extensive Flavian palace on the Palatine suggests that richly ornamented imperial interiors were not just a Neronian speciality. Though mainly constructed during the reign of Domitian, the origins of the palace may date back to Vespasian's reign (Wulf-Rheidt 2015, 6).

It is nevertheless possible that Tacitus is seeking to explain a widely acknowledged shift in manners at this time. In the same passage, he takes the opportunity to explore other reasons for this decline in opulence and the rise of 'spendthrift epicurianism', suggesting firstly that noble Roman families became more reluctant to display their wealth through fear of imperial envy, and secondly that regional families, being promoted to senatorial rank, brought their provincial frugality with them to Rome (*Tac. Ann.* 3, 55).

It is tempting to point to an increasing preference in glass towards less flamboyant colours and decoration at much the same period as perhaps symptomatic of a more sober imperial mood. A simplification of taste at the table might well be reflected in the accompanying tablewares. However, it is difficult to support a model that sees attitudes towards luxury on the part of the imperial family influencing the multiple agents in the glass production chain or the consumption habits of the wider population in so brief a period of time.

8.3 Contemporary Developments in Vessel Form

8.3.1 Cups and beakers

Both cups and beakers were regularly produced in glass after the general adoption of blown techniques during the Augustan period, but cup forms, particularly convex wheel-cut cups of Isings form 12, were much more common than beakers during first half of the 1st century A.D. In Chapter 5, a shift in the relative quantities of cups and beakers was noted from c.A.D.60 onwards (Fig.5.8), with beakers becoming more numerous and more varied in decoration from this point. An increase in the ratio of beakers to cups has also been noted in some categories of ceramics, including Lyon wares (Greene 1979, 142; Tyers 1996, 61; Willis 2003, 127). A change in drinking habits might be being hinted at, with different forms used for mixed/unmixed wine or beer (Cool 2006, 164-68). However, the actual capacities of glass cups and beakers vary across the different forms,

and glass beakers also tend to be smaller than ceramic vessels of the same name (Cool 2006, 182).

8.3.2 Jugs and bottles

A further trend emerging from the data in Chapter 5 is the increase in the number of closed tableware forms (Fig.5.3) and bottles (Fig.5.14). The number of jugs recorded increases between bands A and B and again between bands E and F whilst remaining at about 10-15% of the assemblage in other bands. As was the case with drinking vessels, any comparison with trends in the use of contemporary closed vessels in other materials – ceramics or bronze - is problematic, as function is difficult to interpret. Glass jugs are rarely portrayed in wall paintings or mosaics, and depictions can be ambiguous, such as the possible glass jug in the wine shop sign from Herculaneum (Beretta and di Pasquale 2004, 73 Fig.3). Bottles are more often pictured, but their function can also be equivocal as they are shown in the context of dining as well as storage, as on a tombstone from Cologne (Beretta and di Pasquale 2004, 83 Fig.2) in the later 2nd-3rd century A.D. Simpelveld sarcophagus (Van Es 1972, 148 Fig.105) and the 3rd century A.D. Igel column (Zahn 1982, 12 Fig.8). Data relating to the quantities of glass jugs and ceramic flagons across a number of sites, including Leadenhall Court phase 3 (Cool 2006, 182 Table 17.5), Sheepen periods IV-V (Niblett 1985, 50-51) and the Barzan well deposit (Sanchez 2011, 395-6 Fig.44) indicate that glass jugs were always in the minority, though the practice of recycling glass may affect the numbers recorded. However, ceramic flagons were probably also used for other purposes such as transportation and storage, a role also served by glass bottles and jars, and a direct comparison of function between pottery and glass for these classes of vessels is consequently blurred.

The growth in the number and variety of jugs being produced during the first half of the 1st century A.D. has been linked to the increasing dominance of the use of blown glass during this period and the comparative ease with which closed forms can be made using this technique (Larson 2016, 361-2; Fleming 1999, 33). The diversification of tablewares in pottery and metalware assemblages in pre- and post-conquest Gaul and Britain has also been interpreted as an indication of greater cultural differentiation in the preparation and serving of food and drink (Cool 2006, 152-168; Pitts 2013,146; Woolf 1998, 185-6).

Closed vessels such as jugs, flagons and flasks form part of this expanding repertoire, and glass jugs may also have had a role to play in the presentation of new consumer products, notably wine. Many of the conical and globular jug forms, particularly from sites in the north-western provinces, are highly decorated with vertical and diagonal ribs and pinched handle trails as well as the long necks which appear to become increasing extended over time (Chapter 5.3.4; Fig.2.11, 33; Fig.8.1). This elaboration of the form suggests that these vessels played a prominent role at the table. In Chapter 5.3.4 it was noted that jugs with shorter necks such as squat globular jugs, biconical forms and jugs with pinched-in 'trefoil' spouts (Fig.2.11, 32-4) are strongly represented at Pompeii, whilst forms with longer, narrower necks feature most on sites on the Rhine frontier and in Britain. It could be argued that the preference for the extended neck, a feature that provides a theatrical element to the serving of the contents, reflects different attitudes to the significance of wine at the table, emphasising its status as an imported luxury in the north-western provinces.

Fig.8.1 Jugs from burials at Barnwell, Cambridgeshire (left) and near Sittingbourne, Kent (right) © British Museum

The surge in popularity of glass bottles is one of the most distinctive trends to emerge from the study of vessel form (Fig.5.14). Fleming sees bottles as unsuitable for long distance travel with a role as containers for products being locally exchanged. Pottery, he suggests, would have the 'commercial edge' for moving products in bulk on account of its resilience (Fleming 1999, 61-2). Bottles are certainly common in urban contexts,

where they could have been used to transport merchandise over short distances. The occurrence of the identical base mark ‘Chresimus Fecit’ on pre-Flavian bottles from Usk and Xanten however, indicating that these vessels originated from the same workshop, and the large quantities in which bottles are found on military sites in Scotland, illustrates that they often did travel long distances. The transparency of glass bottles gives these vessels a distinct advantage over storage vessels in all other materials. The quantity and identity of the liquid contents, and to some extent the quality, is visible without the need to open the vessel. The straight sides of the square bottle, produced with relative ease in the mould, allowed the vessels to be closely stacked, sometimes in crates as sometimes seen in funerary groups (Koster 2005). This increased stability and saved space during transport and storage, providing a further commercial bonus. It is unsurprising that these vessels had such an appeal in both domestic and commercial settings and their rising popularity can be understood best in the context of an increasing preference for a more versatile container. However, these thick-walled, sturdy vessels were a glass-greedy product that could only flourish in an environment where raw glass was in plentiful supply and their abundance is, as discussed earlier, symptomatic of a glass industry where the raw product was readily available (7.2.2).

8.4 Colour in context

8.4.1 Introduction

In Chapter 6 the occurrence of strongly coloured, polychrome, colourless and blue/green glass was plotted from the mid-1st century A.D. to the beginning of the 2nd century on sites with closely dated sequences. It was noted that many of the strongly coloured and polychrome vessels became less frequent as the decades progressed, a trend that supported previous commentaries on 1st century glass (see Chapter 1.1.2). A more nuanced picture of the rise and fall of different glass colours was provided by this data than had previously been available. The most significant changes in polychrome, opaque colours, dark blue, dark yellow/brown and purple glass appear in the decades surrounding A.D.70, when there is a clear decline in their disposal. The consistency of this pattern across so many closely dated sites supports the view that this is a connected phenomenon, and a possible explanation will be explored below. Some possible explanations for the rise in popularity of colourless glass through the second half of the 1st century will also be put forward. Firstly, there will be a short review of colour use in other materials to

assess whether glass is alone in seeing a move away from strong colours and polychrome design schemes.

8.4.2 Traditions of colour and decoration in other contemporary materials

Significant changes in one area of material culture are rarely completely divorced from their environment. The modernist movement of the early-mid 20th century for example has influenced every aspect of human experience, from intellectual concepts in politics and philosophy, to artistic expression in music, literature, art and architecture. Within the more enclosed remit of the domestic setting, these wider influences equally have their effect on the everyday. Modernist concepts of simplicity, clarity and functionalism in homeware design for example, that emerged from egalitarian and socialist political thought, have had a major impact on 20th and 21st century glass tablewares. Colourless, plain forms have come to dominate tastes in drinking vessels from everyday tumblers to fine wine glasses, during a period which has seen a corresponding demise in the fashion for heavily facet-cut crystal wares (Sparke 1995; Creagh 2008).

In a broadly comparable sense, neo-Attic and Hellenistic artistic styles, sometimes united under the pluralistic term of 'classicising' are regarded as having a strong cultural influence upon elite Roman society in the late Republican and early Imperial period (Henig 1983; 7-12; Zanker 1988, 239-263; Hölscher 2004; Wallace Hadrill 2008). The impact of Greek artistic traditions on the Roman world is complex and came at a time of intense political upheaval and the establishment of a new political order. These 'classicising' influences are most often discussed in terms of elite consumption in the spheres of architecture and sculpture, but a wider impact on the industrial production of everyday goods is also arguable. The inspiration for Arretine and subsequently Gaulish *terra sigillata* is often cited as emerging from eastern Mediterranean traditions of relief-decorated pottery (King 1983, 181-3; Webster 1996, 1). In glass, Hellenistic techniques such as twisted *reticelli* rods and strip mosaic persist in some forms of early Imperial Roman glass bowl, but these vessels had largely disappeared by the mid-1st century A.D. The changes in colour and decorative style under discussion here then take place within the context of a distinctly Roman glassmaking tradition which was well established by the mid-late 1st century, not an industry under the sway of continuing eastern

Mediterranean influence. Nevertheless, it is worth exploring whether the glass is mirroring some of the trends observed in other materials or is following a separate aesthetic trajectory.

8.4.3 Colour in mosaic and wall decoration

In discussions of interior decoration, the Augustan period has been identified as witnessing a shift in style in the design of mosaics. Katherine Dunbabin for example describes a 'profound change in the nature and position of mosaic' from the Augustan period, with coloured mosaic becoming a rarity in central Italy whilst black and white designs became ever more common. Amongst the reasons cited for this 'austerity' is the assertion that it would have 'appealed to the classicising tastes of the early Principate' (Dunbabin 1999, 56). New mosaics outside of Italy had adopted this style by the later 1st century A.D. The mosaics at the Flavian palace of Fishbourne for example are predominantly monochrome, although an elaborate polychrome mosaic survives in the north wing (Cunliffe 1971, 140-153).

Clarke, in discussing the interiors of houses in Italy, sees the shift in taste in favour of monochrome mosaic as occurring in 'parallel' with some of the new decorative styles in wall painting identified in the move from the Second to Third Styles (Clarke 1991). This shift in style however does not involve a move away from a polychrome palette, and highly coloured designs continued to flourish with the emergence in Italy of the Fourth Style in the third quarter of the 1st century A.D. (Clarke 1991, 65-72; Barbet 1985, 263). This phase, which is difficult to define or date with precision, is divided by Clarke into a number of 'manners', characterised by differing layouts rather than significant differences in the use of colour. The colour palette as a whole remains consistent through these transitions. The very fact that the period requires a subtle categorisation of variants and sees a continuation of many of the features of the Third Style (for example central scenes on mythological themes) suggests that there was no profound change in the fundamentals of decoration in wall painting in the mid-late 1st century A.D. This appears to be equally the case outside Italy, where polychrome wall decoration remained popular, as exemplified in the recent discovery of a highly decorative late 1st century A.D. fresco at 21 Lime Street, London (Betts and Dunwoodie 2016).

There would appear then to be little correlation between the decline in the use of strong colours in glass in the mid-late 1st century and contemporary trends in the use of colour in luxury interior design. Wall painting retained vibrant colours throughout this period and whilst monochrome mosaics become more widespread during the 1st century A.D. the move from polychrome to monochrome geometric patterns had been underway for several generations. Interestingly, polychrome mosaics frequently included individual tesserae of coloured glass, a practice that continued into the 2nd century and beyond. The colours used, particularly opaque colours (white, red, blue, turquoise and green) are uncommon in vessel glass and are therefore unlikely to be recycled from earlier glass vessels in the same colours, though the analysis of the tesserae from West Clacton, Essex, cited above, suggests that some recycled glass may have been used (Chapter 7.4). The implication then is that the specialised production of strongly coloured glass, though in a more limited capacity, continued within the mosaic industry long after it had faded in vessel manufacture.

8.4.4 Colour in contemporary finewares

Correlations with styles in contemporary tablewares in other media, particularly finewares are worth consideration. Within the scope of finer tablewares, glass vessels would have been used alongside locally made and imported wares in a range of colours mainly consisting of grey/black, cream or red/brown, some surface-coated to enhance sheen and colour intensity. Lead-glazed greenish and yellow/brown finewares were also produced in central Gaul during this period and were again in wide circulation but always in limited numbers (Greene 1979; Desbat 1986).

Of the slip-coated wares, Gaulish samian was the most widely diffused across the sites included in this study. The persistence of samian ware, both in colour and style, through the 1st and 2nd centuries A.D. contrasts markedly with the trends seen in glass across the same period. No major change in production or decoration appears to have occurred in the Neronian/early Flavian period, though production increased at this time, and the enthusiasm for these brightly coloured wares showed no sign of diminution through the later 1st and 2nd centuries.

Other classes of fine wares do show more variation during the 1st century, both in form and decoration and in the location of centres of production. Two other highly decorated and colourful groups in particular show an interesting decline at much the same time as the fall-off noted in strongly coloured and polychrome glass. Lyon colour-coated wares and Central Gaulish lead-glazed wares, though never as common as samian, both appear to go out of production in the late Neronian or early Flavian period. Whilst never produced in bulk, they were widely distributed in early post-conquest Britain and the German frontier area. In his study of the finewares from Usk, Greene noted that Lyon colour-coated wares are 'barely present' in Britain by the A.D.70s and are absent from Flavian forts in Scotland and Germany (Greene 1979, 141-142). However a more recent review of the evidence, which notes their presence in small but consistent quantities at early Flavian sites in Britain, suggests a slightly extended date range (Willis 2003; 126-7). The question as to why these specific types disappeared from Britain in the later 1st century has invited a number of explanations. Greene for example points to the disruption of the city of Lyon and its trading services by a series of calamitous events including civil war, siege and fire (Greene 1979, 141-2) whilst Desbat highlights commercial considerations, arguing that whilst imports to Britain may have ceased at this point, fine ceramic production did continue in Lyon for a more local market (Desbat 1997, 32, 105-7). However, none of these theories correlate with the disinclination for brightly coloured wares seen in glass, indeed Greene even suggests that the production of lead-glazed wares may have suffered as a result of the proliferation in glass vessels (Greene 2007, 666).

8.4.5 Colour in contemporary metalwork

Coloured glasses were used extensively to decorate metal objects, particularly in the north-western provinces and Pannonia (Bayley 2015). Polychrome enamelling was used on copper alloy brooches (Bayley and Butcher 2004) and bronze vessels (Breeze 2012) as well as small bronze figurines and other personal items (Worrell 2012). Polychrome enamelling involved the same range of strong translucent and opaque colours as that used in vessel manufacture and decoration. It is therefore possible that the raw glass for both industries came from a common source, or that fragments of the glass vessels themselves were recycled for enamelling.

As Bayley points out however, the high point for enamelling is in the later 1st century and 2nd century A.D. just when the decline of strongly coloured glass vessels is underway, and she therefore considers it unlikely that enough strongly coloured glass vessels would be available for re-use in this way (Bayley 2015, 186-7). This suggestion would imply that the manufacture of strongly coloured and opaque raw glass continued later in connection with enamelling than it did with glass vessels. The fact that opaque red features commonly in 2nd century A.D. enamelling, yet is rare in 1st century A.D. glass vessels would also argue in favour of continued manufacture as a separate enterprise. The discovery of lumps and strips of opaque red glass, most likely for use in enamelling, in 1st and 2nd century contexts in Roman Britain illustrates the continued production of strongly coloured glass, though the location of that production is unclear (Bayley 2015, 185-6).

This chronological mismatch between the peaks in use of strong colours and polychrome decoration in enamelling and in glass vessel manufacture is intriguing. It demonstrates a continuing taste for highly coloured decoration at a point when it had largely disappeared in glass vessel production as well as the ongoing production, perhaps for this specialised purpose, of strongly coloured glass into the 2nd century A.D.

8.5 The Rise of Colourless Glass

8.5.1 Colourless glass and existing traditions of glassmaking

Evidence from other material therefore suggests that the decline in the use of strong colours in glass in the second half of the 1st century has no strong correlation with the expression of colour elsewhere. In Chapter 1 it was noted that the re-appearance of colourless vessels and the decline of strong colours are often linked as related episodes, as they occur at much the same time. If the disappearance of strong and polychrome colours in glass occurs in isolation from other media, then the reasons behind the rise of colourless glass over the course of the second half of the 1st century A.D. (Fig.6.8) may also represent an independent trend, rather than a response to changing attitudes to polychromy and vivid colour use in the wider Roman world.

Techniques to decolourise naturally blue/green glass were first developed in the mid-1st millennium B.C. High quality colourless vessels occur at Achaemenid sites (Ignatiadou 2010; McCall and Dusting 2017) and in the late Classical Greek and Hellenistic industries of the eastern Mediterranean (Ignatiadou 2002; Arveiller-Dulong and Nenna 2000, 168-78). However, in the 1st century B.C. and the early decades of the 1st century A.D, colourless glass had almost disappeared in the production of monochrome vessels, though it was retained as an element in polychrome mosaic vessels, such as *reticelli* and strip mosaic bowls. By the time of the revival in the use of colourless glass in the second half of the 1st century A.D., it had been largely unused for monochrome vessels for over a century. It is worth considering then why the medium should make a return at this point, given that there was a longstanding existing knowledge of the techniques of decolourisation.

In Chapter 6.2.6 it was noted that whilst colourless vessels were present on many of the sites they only formed a very small proportion of those assemblages and were largely restricted to drinking vessels and a small number of bowls (figs.6.8 and 6.9). Sporadic colourless vessels occur in the A.D.50s but it is during the A.D.60s-70s that the main increase is seen, though colourless glass rarely exceeds 6% of the assemblages (Fig.6.8). Across the entire study period, nearly three quarters of the recognised colourless forms are drinking vessels, with only 12% being containers or serving vessels (jugs or jars). The quality of the glass in many of these earliest colourless drinking vessels is high (appearing water-clear), a characteristic that compliments the fine decoration and finishing also present. This is most apparent in the largest single colourless category in the pre- and early Flavian assemblages, which is vessels with facet or relief-cutting. Fragments of these distinctive, highly decorated vessels, the overwhelming majority of which are for drinking, are very visible archaeologically on account of their complex production process. The interior surface is shiny, reflecting the first stage of manufacture as a blown blank. The exterior surfaces are entirely ground and polished, leaving zones of close-set facets (the most frequent design) or other combinations of decorative motif. This complex cutting shows no obvious stylistic continuity from preceding or contemporary glass vessels, which makes the sudden appearance of colourless facet and relief-cut glasses within the tableware repertoire an even more intriguing phenomenon.

Facet and relief-cut colourless glass has however been discussed in connection with contemporary objects made in rock crystal (von Saldern 1991, Vickers 1996, Stern 1997) with which it can be compared in colour, clarity and finish. The high quality of colourless glass of this period is closely comparable with the clarity of rock crystal. Pliny the Elder made the link explicit:

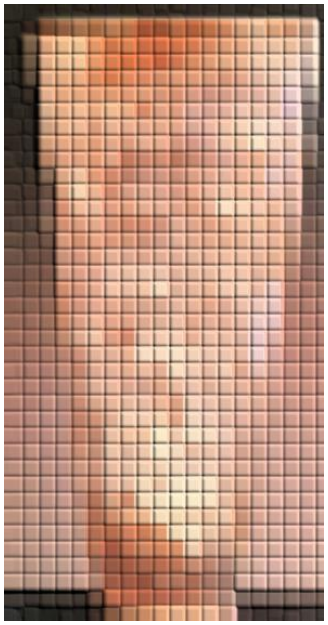
'Glassware has now come to resemble rock crystal in a remarkable manner, but the effect has been to flout the laws of nature and actually to increase the value of the former without diminishing that of the latter.' (*Plin. HN* 37, 10)

'Still, however, the highest value is set upon glass that is entirely colourless and transparent, as nearly as possible resembling crystal, in fact.' (*Plin. HN* 36, 67)
Pliny's remarks, made in the very years that entirely colourless vessels were re-entering the glass repertoire, imply that efforts were being made at the de-colourising stage (whether at the primary or a secondary furnace) to replicate crystal. A suggestion by Martial in an epigram to Flaccus that he should use glass whilst awaiting the arrival of crystal illustrates their relative costs and implies that one can be seen as a substitute for the other more expensive material (*Mart.* 12, 74, 1-6)

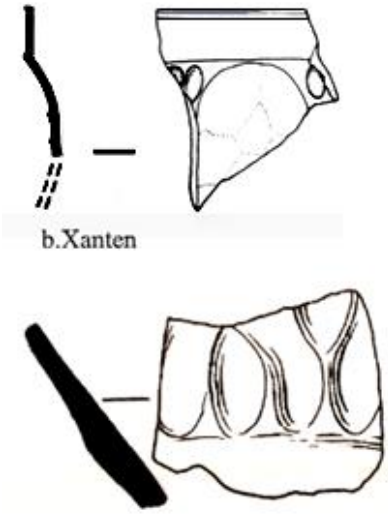
Rock crystal vessels are rare, and often small (Bühler 1973, 54-56 nos.42-57, taf.14-18). The entire surface of crystal vessels was ground to form the profile and interior cavity and sometimes polished flat, as on a miniature amphora from Bordeaux (de Pury-Gysel 2007, 76-77 no.105 Fig.7). Complex facet cutting is however absent from earlier and contemporary crystal objects and vessels. Stern convincingly credits the invention of facet-cut designs on the outer surface of vessels to Roman glassmakers (Stern 1997, 202-4). She also differentiates between 'hollow' facets, cut into the underside of colourless glass bowls and plates, creating an effect of raised knobs on the upper surface, and 'surface' facets cut into the outside of the vessel (such as the conical beakers of Fig.8.2), which would reflect surface light. Stern links the effect produced by 'hollow' faceting to the designs on contemporary silver and gold wares. Whilst this may have been the case, 'hollow' facets sit slightly later chronologically than the late Neronian/early Flavian 'surface' faceting of the earliest conical beakers. These 'hollow' facets are cut on the underside of the rims of wide-rimmed plates and bowls (Fig.2.11.9) a form that occurs at the end of the 1st century, after the introduction of facet-cut conical beakers. An artistic

division between the desired effect from the two styles of faceting is plausible, but the development of ‘hollow’ facets is likely to have sprung from a knowledge of ‘surface’ faceting. Nevertheless, as was noted in Chapter 6.3.6, the nature of the cut decoration on the earliest colourless conical beakers suggests that their creators were already highly skilled, which would support the theory that they brought existing expertise and equipment from stone and gem cutting and applied them to the softer material of glass where innovative and highly creative design combinations could be explored.

Some of the earliest securely dated examples (A.D.60s - early70s), from sites studied in this thesis and elsewhere, demonstrate the diversity of designs as well as the complexity of execution already apparent at this initial phase of production (Fig.8.2). Close-set hexagonal facets, the most common design, are seen on two fragments dated to before A.D.75 at Fishbourne (Fig. 8.2.d; Harden and Price 1971, 342 nos.42 and 43, Fig.139, pl.XXVI). Other early vessels from Pompeii (Fig.8.2.a; Harden 1987 192 no.102) Exeter (Fig.8.2.c; Charlesworth 1979b, 224 no.12, Fig.70), Leadenhall Court, London (Fig.8.2.d; Shepherd 1993, 104-5 no.67 Fig.60 and 63) Eysses (Fig.8.2.g; Chabrié 2010, 149, Fig.2 no.34) have interlocking jigsaw facets. A combination of facets and indents is used on vessels from Xanten (Fig.8.2.b; Hanel 1995, taf.154, E131) and Leadenhall Court (Fig. 8.2.e; Shepherd 1993, 105 Fig.59 and 63) and a motif in high relief is on a second vessel from Eysses (Fig.8.2.f; Chabrié 2010, 148, Fig.1 no.13). Two jigsaw-faceted beakers and an indented and ground vessel from the siege camp at Masada, Israel (c.A.D.70-A.D.73/4) suggest that this is an empire-wide trend (Jackson-Tal 2016, 67-71 Fig.7 nos.1-2, Fig.8 no.5). That such a range of designs, not seen previously on glass, should be used exclusively on colourless vessels as soon as they reappear in the repertoire clearly demonstrates the divide between this production and existing glass-making traditions.



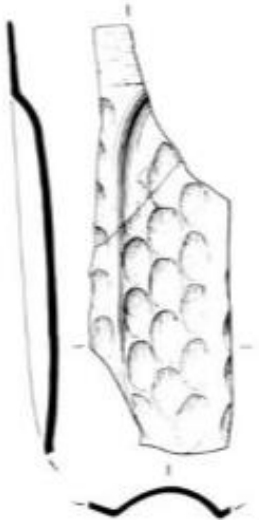
a. Pompeii



c. Exeter

d. Fishbourne

d. Leadenhall Court



e. Leadenhall Court

f. Eysses

g. Eysses

Fig.8.2 Facet-cut and high relief-cut fragments from contexts dated from A.D.65-80 (a. © Olivetti (no permission for online use) ; b. after Hanel 1995 c. after Charlesworth 1979b; d & e. photo courtesy Edwin Baker, drawing after Shepherd 1993)

8.5.2 Colourless glass and vessel form

Perhaps the clearest indication that colourless glass did not simply move into the general glassworker's repertoire of raw material is its limited adoption across the wider range of forms. The comparison between the range of forms produced in colourless glass and other colours (Fig.6.10.a-b) shows that it was largely restricted to drinking vessels. Only 9 jugs

in colourless glass were clearly identified across all the assemblages studied in Chapter 4. Of these, 6 came from the very latest (Band G) sites, which edge into the early 2nd century A.D. Colourless flasks and jars were equally rare.

Even within the general categories where colourless glass appears most strongly (drinking vessels and bowls), there is seldom any adoption of colourless glass into existing forms, even the most common. No colourless non-blown ribbed bowls (Isings form 3) are known for example. Whilst later 1st century A.D. wheel-cut cups were produced in colourless glass (Price and Cottam 1998, 88-9, 91-2) the common convex sided Isings 12 type cups are rarely noted as being colourless, and where they are the shade is usually 'greenish colourless' rather than the water-clear colourless of facet-cut beakers. It could be argued that this general absence reflects the decline in manufacture of these forms at a time when colourless glass comes into ascendancy. Nevertheless, other forms that continue to be produced in quantity throughout the period, such as tubular rimmed bowls (Isings form 44 and 45) do not appear in colourless glass in the 1st century A.D either. Some mould-blown beakers occur in good quality colourless glass and strong colours (at Usk and Eysses for example), but these are unusual. The last major group of vessels to be produced by non-blown techniques, bowls with wide (sometimes overhanging) rims (Fig.2.11.9) which are predominantly colourless, are a new introduction in the late 1st and early 2nd century. Grose noted a gap between the demise of strongly coloured non-blown 'fineware' bowls and the arrival of these non-blown wide rimmed bowls (Grose 1991, 12-13) and they are barely present in the assemblages in this thesis.

A model that sees colourless high quality vessels as directly emerging from, and linked to, existing trends in glass is therefore difficult to support. The majority of these early colourless vessels appear instead to form a restricted repertoire, with their complex, time-consuming decoration indicative of a highly-prized and costly product. This sense of luxury also extends to the display of the contents of the vessels. Facet cutting in particular has the potential to enhance the appearance of coloured liquids, notably red wine. These beakers then can be regarded as playing a role in showcasing the consumption of wine at the dining table, previously unachievable by coloured glass drinking vessels. It is nevertheless intriguing that serving vessels, namely colourless jugs, were not decorated in a similar fashion, perhaps a reflection upon which members of the household may have served wine and which ones held drinking vessels. An unusual small jug in the British

Museum (which has a straight sided body, expanding out) is a rare example of a handled vessel decorated with interlocking facets (Harden 1987, 193 no.103). It is possible that larger, convex-sided, handled vessels presented a particular challenge when cutting facets.

On this basis, it is suggested here that colourless vessels were not a direct replacement for strongly coloured and polychrome glass, as had often been implied in discussions of 1st century glass (Chapter 6.2.6). It is the role of colourless glass as a high-status material for the display of a product denoting an elite lifestyle, rather than simply another colour for the glassmaker to exploit, that provides the key to understanding its initial use.

Very little is known about where these early colourless cut vessels may have been manufactured, nor how many workshops may have been engaged in this highly skilled activity. Although they have a wide distribution, the similarity in profile and finishing may indicate a limited number of production centres. Axel von Saldern suggested that vessels with high relief cutting might come from 'one or more workshops in the Naples-Rome region' (von Saldern 1991, 117). Nenna and Oliver have pointed to Egypt as a possible origin (Chapter 7.5.3). If a transfer of skills between rock crystal working and glass cutting is proposed then the locations of those workshops would also be pertinent to the discussion, but they are difficult to identify. Crystal was mined at a number of locations, including Egypt and the Alps. The proposed close connection between primary and secondary glassworkers in the production chain of relief- and facet-cut beakers (Chapter 7.5.3) would make the possibility of an eastern origin reasonable.

8.6 Changes in the Industry

8.6.1 Increase in raw glass production

There seems then to be no obvious trend away from strong colours or polychrome schemes in other media that might have had an influential effect on glass production or be symptomatic of a wider change in taste that encompassed glass. The increase in the use of colourless glass also appears to be best regarded as a contemporary, but not necessarily connected, phenomenon to the decline of strong colours, rather than an agent of that decline. This being so, other explanations for the end of colour production need to

be explored. This section will discuss the significance of the other major contemporary trend in glass, the expansion of the quantity of glass in circulation and the spread of new secondary workshops through the western provinces.

In Chapter 7, the evidence for primary and secondary glass production during the 1st century A.D. was brought together in a review of both physical remains and current analytical research. Whilst the majority of the surviving archaeological remains for primary glass production are from later periods, there are enough circumstantial indicators at the consumption end of the chain to suggest that the second half of the century saw a remarkable increase in the quantity of glass being produced. These were discussed in detail in Chapter 7.2.2 and can be summarised as:

- The introduction and widespread adoption of large, heavy storage forms (notably bottles)
- The use of glass windows in new buildings, in particular bath houses
- The introduction of glass to previously non glass-using regions (such as Britain)
- The increasing number of secondary glass workshops attested in the provinces

Several factors can be identified as enabling this expansion in the glass industry. Trading relationships crucial to the transfer of the necessary raw materials (notably natron, which is likely to have been moved from Egypt to the Levantine coastal area) had been increasingly protected as sea routes benefitted from a relatively peaceful and policed Mediterranean since the suppression of piracy in the 1st century B.C. The development of high capacity merchant ships during this period also facilitated the transport of larger, heavier cargoes over longer distances (Casson 1991, 191). Although not closely dated to the 1st century A.D., the furnaces from Beni Salama illustrate how industrial practices had developed to allow for the production of raw glass on a scale not previously seen (Chapter 7.2.2). These raw glass production sites were dedicated manufacturing centres with focussed output on a single material. Although some of the glass may have been processed into vessels in workshops in the surrounding region, much of the output from primary production sites in the Levantine coastal region must have been earmarked for transfer to secondary producers across the empire within an extended chain of production.

The boom in glass production was thus driven from both ends of this chain. The combined circumstances of an industry with the technical potential to produce high volumes of raw material and a political climate more advantageous to long distance trade promoted increased output on the one hand, whilst at the same time greater consumer demand needed to be satisfied.

With the spread of secondary glass workshops in the western provinces the raw glass industry, based in the eastern Mediterranean, was increasingly at arm's length from the producers of vessels elsewhere in the empire (Fig.7.1). This more dispersed network would inevitably have seen an extended supply-line of raw glass becoming increasingly fragmented because of the likely need for intermediaries. At the same time, the leading requirement in terms of volume of raw product was untreated blue/green glass, for the tablewares which had always been chiefly produced in this colour, and now for bottles and windows. If, as has been argued (Chapter 7.4), raw glass was coloured before it reached vessel-making workshops, then this heightened demand for untreated blue/green glass could have had a major impact on the rest of the colour range.

8.6.2 The effect on vessel production

There is as yet little understanding of the structure of the 1st century A.D. glass industry in the sense of ownership and control of the various elements of the production chain. The likelihood of elite, even imperial, control or at least intervention in other types of raw material production is argued by many commentators, for example in mining and quarrying and in the production of bricks (Hirt 2010; Lo Cascio 2007). As for the final section of the manufacturing chain (the production of vessels) it has been argued that in the ceramic industry, specifically the production of terra sigillata, there was a distinct division between the (elite) control of the raw material and the more humble producer of the finished product (see for example Kehoe 2007, 562-564). Again, possible imperial involvement in the placement of contracts has been proposed as an explanation for the consistent supply of high volumes of terra sigillata vessels to frontier settlements (Fulford 2013, 11-13). This model for ceramic production however does not transfer easily to glass production. Whilst there may have been instances of contracts formed at imperial or senatorial level, as for example in the supply of glass for elite construction projects, such as the imperial bath houses in Rome (Chapter 7.2.2), raw glass production and vessel

manufacture were not generally carried out (unlike ceramics) at the same location. With glass there is a separation between the two ends of the production chain (raw glass production and vessel formation) that in the western Mediterranean increased with distance. In this scenario, the vessel producers in the increasingly disparate, relatively small-scale secondary workshops had limited, if any, control of the material being supplied to them, nor were they easily able to influence supply on the basis of the tastes of consumers.

As the market for glass vessels grew and dispersed, the complexity (and as a result perhaps the cost) in providing product variety in the form of multiple colours along a more fragmented supply chain will have increased. With higher demand for ever larger quantities of blue/green glass, a decline in the supply of niche strong colours seems a likely consequence. The desire for high quantities of raw glass would shift production towards the output of a simpler, untreated product.

A similar effect has been identified in 19th and early 20th century industrial output, particularly in the economic history of the United States. There are obvious differences in the character of industries in the early Roman empire and 19th-early 20th century America, especially in the nature of the workforce, the supply of power, the available transport and communication systems and the concept of factory output. Nevertheless, there are certain common factors such as growth in demand, an extended supply line and bulk production to make a broad comparison instructive.

The internal organisation of a number of major 19th century American enterprises, notably rifle manufacturers, was widely regarded by contemporary industrial analysts as increasing efficiency and reliability in a process described as the ‘American system of manufactures’ (Hounshell 1984). Key aspects were the standardisation of products and the interchangeability of component parts in the context of an expanding economy and a consumer base willing to accept cheaper, uniform products (Harley 1991, 36). These characteristics retained their importance in the era of mass production, as the system developed and expanded into new product areas in the later 19th and early 20th centuries (Pine 1993, 14-29; Piore and Sabel 1984, 191). The system of mass production was most famously championed by Henry Ford in the assembly lines of the Model T, where a single

variety of car, built from standardised components, satisfied a spike in consumer demand for a relatively novel product.

Although there is no equivalence here in the types of products being offered, a broad comparison can be drawn in the relationships between demand, supply and product variety. With demand for glass high, and the largest requirement being for naturally coloured glass (for example to produce windows), then most consumers would be adequately satisfied with that basic commodity. This is particularly the case when an extended supply chain sees products being passed through a number of agents and where there is delayed communication, or feedback, along the line. To paraphrase Ford 'you can have any colour of glass, so long as it's blue/green'.

Trade in raw glass is only rarely alluded to in documentary sources of the 1st century A.D. and there is no information about the level and nature of contact between primary and secondary producers, the means by which the transfer of glass was negotiated, nor the logistics of carriage. Evidence from maritime excavations hints at a complex and indirect pathway between initial raw glass production and end user (in this case the secondary workshops) and allows us to proceed some way in constructing a model of supply. The two major shipwrecks with raw glass cargoes which relate most closely in date to this study are Mljet and Cap Corse 2 (Chapter 7.2.1). In neither case was raw glass the only cargo; Cap Corse 2 is not yet fully excavated, but initial surveys show it was also transporting vessel glass and amphorae. The Mljet ship was also carrying a large quantity of ceramic vessels from southern Italy, goods in amphorae, lead and lead compounds. There has been a suggestion that the glass may have been used as ballast, staying on board over an extended period whilst the ship stopped to load and unload other cargoes, though this is difficult to substantiate (Radić Rossi 2012, 24). From the albeit limited body of evidence from the 1st century A.D., and bearing in mind that most of the shipwrecks examined are close to shore rather than in deeper waters, it does seem that the raw glass was not being directly shipped as a sole cargo from source to secondary workshop but was part of a more complex system incorporating a number of ports and traders. The variety of agents, including citizens, soldiers, freedmen and slaves, involved in the purchase and exchange of goods is illustrated by recent finds of writing tablets from the Bloomberg site in London. These record the complexity of financial transactions between individual contractors, including loans, part payments and receipts (Tomlin 2016, 51-54).

How organised the movement of glass was across the empire is impossible to establish. Recent reviews of the trade in raw glass throughout the Roman period emphasize the fundamental role of shipping in the distribution of the product, with entrepôts acting as nodes in the chain of supply between primary producer and secondary workshop (Foy and Fontaine 2007; Wilson, Schörle and Rice 2012, 374-379; Fontaine 2014). It is possible that specialised and established traders in raw glass commissioned and distributed material to multiple secondary workshops as *negotiatores* in a single commodity (see Rice 2016, 98-100), or that a more haphazard network brought glass as irregular cargoes, dependent perhaps on the workings, seasonal or otherwise, of the primary workshops. Seasonality in shipping, with reduced movement in the winter months, may also have interfered with supply (Hawkins 2016, 32-35). Without further excavation, or new epigraphic sources, the questions remain open.

As demand rose and the network of workshops grew more widespread, providing bespoke colours would have proved ever more challenging and standardisation of colour (with natural blue/green being the simplest to produce) is likely to have increased as a consequence. In this scenario glass was being supplied as a uniform product along most of its supply chain, until it was transformed into vessels. The point at which variety was first introduced was no longer at the beginning of the chain (raw glass colouration) but was delayed until the form and decoration of the vessel were chosen in secondary workshops.

In modern business logistics, the term ‘delayed differentiation’ or ‘postponement’ was first defined in 1950s management literature to describe a cost-effective method of facilitating increased production to a wider audience of consumers (Venkatesh and Swaminathan 2004). The concept was further popularised by Joseph Pine, who demonstrated how late customisation of a product allowed variety to be re-introduced at a later stage in the manufacturing process (Fig.8.3).

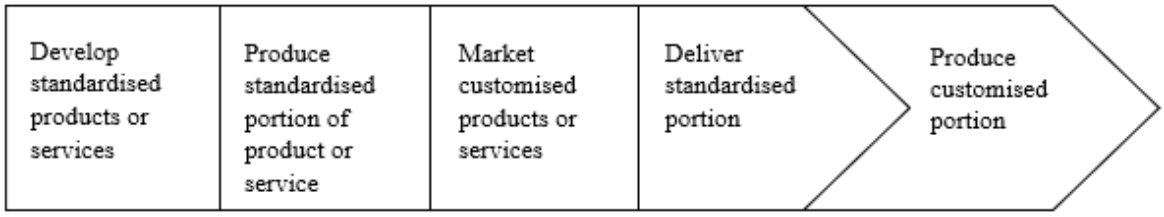


Fig.8.3 From standardised product to customisation (adapted from Pine 1993, 184, Fig.8.4 Changes in the Value Chain to Produce 'Point of Delivery' Customisation)

A simplified model can be cautiously applied to Roman glass vessel production if the complete process – from raw glass production to final vessel finishing – is pictured as a long-distance assembly line (Fig.8.4)

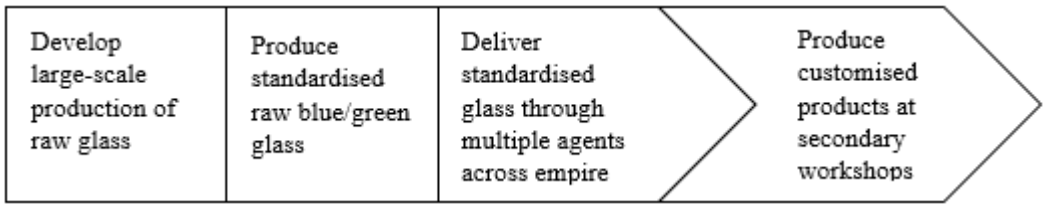


Fig.8.4 Delayed customisation translated to the production of glass vessels

Clearly there had always been a large element of late customisation in the production of glass vessels, as the selection of form and decoration had always been in the hands of the glassblower. What changes here is that the initial point of diversification has moved away from raw glass production, with its wide palette of colours and that *all* elements of customisation now occur during the last stages of production, the secondary workshop.

Whilst this explanation remains speculative, there is further circumstantial evidence that supports it. The data from Chapter 6 shows how yellow/green glass persists into the later 1st century (Chapter 6.2.5). It was also noted that sporadic yellow green (and some yellow/brown) vessels also continue to be seen during the 2nd century, long after other strong colours have disappeared. A few yellow/green jugs, jars and bowls for example have occurred in Antonine assemblages in Britain, for example in the pit groups at Towcester (Price 1980), Felmongers, Harlow (Price 1987) and Alcester (Fig.8.5; Price and Cottam 1994).

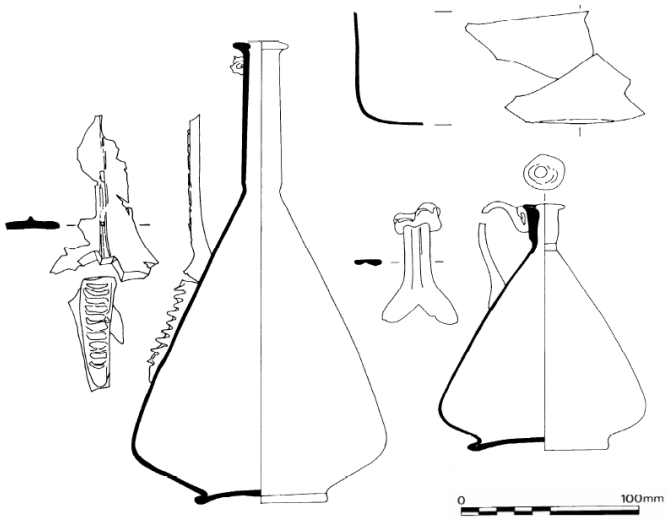


Fig.8.5 Yellow/green vessels from an Antonine pit at Alcester (Drawings © Council for British Archaeology, from Price and Cottam 1994)

In contrast to colours such as dark blue and purple, which are thought to be determined at the beginning of the production chain by the addition of colourants, yellow/green shades are more likely to be regulated in secondary workshops. In these circumstances then, colour is still a desirable feature, but is only achievable by 'customisation' by glassworkers exploiting furnace conditions at the end of the production process, as strongly coloured raw glass is no longer being produced and distributed. Colourless glass sat apart from this model for several reasons. Newly re-introduced in a range of novel highly decorated forms in the third quarter of the 1st century, they formed a separate category of luxury vessels, with a distinct workshop operation where, it is argued, there was closer communication between primary and secondary production (7.5.3). As an elite product, these vessels would have been unaffected by the pressures on the general glass repertoire that led to the standardisation of colour. Though occasionally used in decoration, for example on 'snake thread' vessels and late Roman blobbed vessels, strong colours never regained their previous popularity. Colourless glass on the other hand became ever more common during the 2nd and 3rd centuries, losing its exclusiveness in a colour range increasingly reduced to only two shades.

8.7 Summary

This chapter has investigated some of the political, cultural and economic forces that may have influenced developments in the colour and style of glass vessels over the second half of the 1st century A.D. Firstly, factors external to the glass industry were explored. Whilst it was acknowledged that political events and social upheaval may have had a local effect, these were not seen as satisfactory explanations for trends which were empire-wide, namely the disappearance of strong colours and the increase in the use of colourless glass. No compelling evidence could be found that linked preferences for less flamboyant tablewares to attitudes emerging from the transition of the imperial regime from the Julio-Claudian dynasty to the Flavians. Changes in taste in other artefact groups and in interior decoration were also not seen to correlate closely with glass. Strong colours and polychrome designs persisted for example in wall painting and mosaic. In metal-working, particularly copper alloy vessels, figures and brooches, instances of polychromy involving glassy materials actually increased through the later 1st and into the 2nd century.

Explanations for the decline in colour use were then sought within the structure of the glass industry itself. A surge in demand for raw glass, and the creation of facilities to meet this demand with the construction of large tank furnaces, are argued to have increased the dominance of a single uniform product. The continued creation of smaller quantities of strong colours may have become increasingly unnecessary in an environment where naturally coloured blue/green glass satisfied the majority of consumers. As product variety was no longer introduced at the beginning of the supply chain, the point of differentiation was transferred entirely to the secondary workshops and into hands of the vessel producers.

Colourless glass vessels, often regarded as moving into the territory vacated by strongly coloured tablewares, are viewed here as following a different pathway. Although parallels have been drawn with luxury vessels in rock crystal, support was also given to the argument that the distinctive decoration of close-set facet-cutting is particular to glass. The complex cutting on the earliest blown colourless drinking vessels however shows a degree of competence that indicates that those undertaking the decoration had an already highly developed skill-set in place.

Concluding Remarks

Summary of Findings

This thesis began by posing three straightforward questions: What were the main changes in Roman glass vessels in the mid-late 1st century ?; Was it possible to establish a detailed chronology of the changes by the examination of dated assemblages ?; Finally, what were the reasons for these changes ? As is so often the case in archaeological research, simple questions never produce simple answers, and this is especially so with a material like glass.

Establishing a chronology for these changes with as precise a resolution as possible was one of the main challenges in this thesis. Success depended upon the accurate recognition of vessel forms within a consistent system of classification (2.5, 2.6) derived from established typologies and personal research. The decision to analyse assemblages with closely dated deposits inevitably imposed constraints upon the selection of sites. Some geographical areas are underrepresented (mainly in France and Italy) and there was a considerable range in the size of samples. Dating episodes of past activity and their associated material remains with accuracy is particularly testing. The debate over the dating of military sites in Scotland for example (3.7) demonstrates how chronology, even with the support of literary evidence, is never a fixed matter.

Most challenging of all perhaps for this thesis was the question of quantification (3.9). The data encompassed 49 assemblages from 37 sites (Chapter 4). Although many of these were seen at first hand and therefore received a uniform approach to vessel recognition and quantification, in other cases publications by other specialists were used, which inevitably employed slightly different criteria. As far as possible these discrepancies were acknowledged and compensated for, and the success of this method is reflected in chapters 5-7 where definite patterns emerged and chronological changes were identified with greater accuracy and precision.

Chapter 5 revealed several trends in vessel form and decoration. A continuing decline in the numbers of non-blown vessels across the study period (Fig.5.1) was recorded, complimenting and extending the research of Larson (2016) and Prior (2015). Mould-blown tablewares, whilst exciting a high level of interest amongst researchers on account of their complex decoration and the fact that some are named, were shown to be relatively rare vessels. The continued expansion in the use of blown techniques was demonstrated across the study period, with a higher rate of increase during the period A.D.50-70 and a corresponding steeper decline in non-blown vessels at the same point.

It was also possible to identify trends in use relating to individual categories of vessel. A decrease in the variety and number of cup forms was contrasted with an increased diversity in beakers, though a straightforward move from one type of drinking vessel to the other was discounted (5.3.2). The appearance of simple rounded rims on some newly introduced forms of drinking vessel in the last decades of the 1st century was seen as reflecting the expansion of secondary workshops, with increased local vessel production involving less complex working practices, and perhaps transient glassmakers (7.6). A discussion of the extent to which glass was used in the manufacture of bowl forms was prompted by the analysis of the relative proportions of non-blown ribbed bowls and other bowl forms (Fig.5.16). Whilst tubular rimmed bowls were noted throughout the study period, particularly on the Italian sites, no other distinctive form was noted with any regularity across the data-set. The near-absence of non-blown wide rimmed bowls implied that the introduction of this form may be later than is usually argued (Price and Cottam 1998, 55-59)

For the first time, the frequency of occurrence of individual strong colours was calculated over a set period of time, throwing new light on the inter-relationship of different colour categories, their individual prominence within the range of colours used, and the rate at which they fell out of use. Overall the data showed a decrease in the use of polychrome glass and strong colours, in particular dark blue, purple, dark yellow/brown and dark green (6.2.2-5, Fig.6.15). There were nevertheless differences in the rate of decrease between colours, with polychrome vessels amongst the earliest to decline, whilst dark green and dark blue appeared to remain in circulation slightly longer. No specific reason for this difference could be identified, though it was noted that there were some possible regional variations in the pattern. Attention was drawn to the scarcity of purple glass, a

phenomenon that has not previously been appreciated and which raised questions regarding the role of purple in Roman society, with its rarity implying possible restrictions on its use (6.2.4).

Specific focus was given to the data concerning colourless glass, in particular the date of its introduction, its frequency and the range of vessels for which it was used (6.2.6). The fact that colourless glass makes a re-appearance in the 1st century has been long established in glass studies (1.1.2, 6.2.6), but little attention was previously given to the rate at which it was adopted. The analysis of this dataset reveals that whilst there was a steady increase in colourless vessels through the last 40 years of the 1st century (Fig.6.9), it rarely exceeds 6% of the tableware assemblage. It was also possible to link the data on colourless glass with observations concerning vessel form and decoration. In Chapter 5 it was shown how the limited range of non-blown forms introduced in the last decades of the 1st century had a strong correlation with the use of colourless glass (Table 5.1). This is the first indication of a special relationship between particular forms and production techniques and the use of colourless glass, a link confirmed by observations concerning the near absence of colourless glass to produce vessels in the repertoire of forms which were found in the pre-Flavian assemblages and continued to be made in the later 1st century (6.2.6). Furthermore, it was shown that colourless glass was largely restricted to the manufacture of drinking vessels, and occasionally non-blown bowls, whilst colourless jugs and blown bowls remained rare during this period (6.2.6 Fig.6.9).

Further support for the characterisation of colourless glass as standing apart from some of the trends seen elsewhere in the data came from the fragments of beakers with facet and high-relief cutting (5.3.2). These vessels, long identified as being at the higher end in terms of glass luxury (Oliver 1984, Stern 1997) are the most distinctive of the colourless forms which appear in the second half of the 1st century. The examples identified in the assemblages in Chapter 4 demonstrated the high level of workmanship as well as a complexity in design, even in the very earliest facet-cut vessels, lending support to the argument that cutting skills were adapted from other materials (8.5.1).

Attention was then turned to one of the central themes of the thesis, the abandonment of strongly coloured and polychrome glass. This phenomenon was not paralleled in other areas of Roman material culture, which saw a continuation, and in some cases an

expansion in the taste for polychrome design during the later 1st and into the 2nd century A.D. (8.4.2). The idea that colourless glass directly replaced strong colours was dismissed, as it was produced in smaller quantities and for an entirely different and much more restricted range of forms (6.3, 8.5) as noted above. Instead, answers were sought in the contemporary increase in the amount of glass in circulation and alternative suggestions were put forward as to why blue/green glass came to dominate and strong colours subsided.

Tracking the occurrence of forms across all the dated bands it was possible to see a distinct growth in the numbers of blue/green bottles recorded. A striking jump in these bulky vessels, which required substantial quantities of glass, occurred c.A.D.60-70 (figs.5.2 and 5.14). The proliferation of thick glass window panes, also naturally coloured, and the pressure on demand for glass that these items would stimulate was also noted. On this basis a case was made for an extraordinary increase in the production of raw blue/green glass, which came at the expense of the existing output of strong colours. In the course of this argument, reference was made to modern theories concerning mass production. Whilst it was made clear that there could be no equivalence between the economy of ancient Rome and that of the modern western world, some basic concepts were seen as being useful in understanding how demand might lead to the simplification of the production chain (8.6.2). The reduction in the range of colours being used to produce glass vessels was explained as resulting from this spike in demand for naturally coloured glass. Suppliers of raw glass were able to satisfy the needs of the overwhelming majority of glass users by the production of a simple uniform product – blue/green glass. It was argued that providing individual strong colours would prove increasingly unnecessary when most glass consumers were satisfied without them. It was also proposed that providing a range of colours to an expanding network of secondary workshops in an extended and complex supply chain would prove increasingly challenging.

Suggestions for Future Work

The purpose of this thesis was not only to attempt to answer questions concerning the changes in glass in the mid-late 1st century A.D., but to provide a dataset that might be built upon for the purposes of future research. The structure used for the presentation of data, where individual assemblages are analysed separately, and fragments recorded in

simple, consistent categories, allows further contributions to be made with little difficulty. Additional assemblages would enhance the quality of the sample in terms of quantity of data, increasing confidence in the degree to which the results noted here are representative. There are instances where one or two very large assemblages dominate individual dated bands in Chapter 4, for example Pompeii (band E) and Nijmegen *canabae legionis* (band G). A greater range of sites in terms of character would also enhance the data-set, as certain dated bands also show an unequal representation of military and civilian assemblages, as for example in band F, which contains several military sites from northern Britain.

The geographical reach of this thesis encompassed Britain, the lower Rhineland, France and Italy, as these regions produced a manageable sample of closely dated assemblages which could be studied at first hand or were published in detail. There is ample scope to extend the survey to take in a wider area, bringing in assemblages of 1st century A.D. glass from, for example, Corinth in Greece (Davidson 1952, 78-83), Benghazi in Libya (Price 1985b), Tarragona in Spain (Price 1987c) and Masada in Israel (Jackson-Tal 2016). Not only would the addition of these and other groups increase the sample size, they would also offer the opportunity to compare trends in glass vessels across the empire. An expanded database would also allow more sophisticated statistical analysis to be employed which could further explore the relationships between colour and form and investigate the impact of geographical location or the role and status of individual sites.

Assemblages from the eastern Mediterranean would prove a particularly interesting addition to the dataset given their relative proximity to the locations of raw glass production. Direct evidence for raw glass production in the 1st century A.D. is limited (see above 7.2.1) and contemporary furnaces have yet to be identified securely. The structure and organisation of early imperial furnaces is inferred from our knowledge of excavated primary furnaces from later periods. The discovery and investigation of earlier workshops would be therefore particularly beneficial.

There has been increasing awareness in glass studies of the need to integrate programmes of compositional analysis with the study of vessel form, colour and chronology (see 1.3.2) and the results of this thesis argue strongly for further work in this area. The study of purple glass is highlighted here as a potential case study, as it shows unusual patterns of

use in comparison with other strong colours as well as idiosyncrasies in the range of vessel forms for which it was used.

Grounded in the detailed observation of vessel use and a close attention to chronology, data-driven studies such as this have enormous potential to contribute to wider discussions of the Roman economy. Glass is one of the few commodities where different sections of the production sequence can be isolated and studied. Its role as an informant on general themes concerning production, distribution and consumption is currently receiving particular attention from archaeological researchers (Rosenow et al. 2018; Foy 2017; Foy et al. 2018). With its extended production chain, its wide commercial reach and its transformation into vessels for so many different functions, glass is interwoven into all aspects of the Roman world, from industrial practices, shipping and trade to the simple transactions of daily life. This thesis has taken an ambitious approach to one of the most complex and intriguing periods in the story of Roman glass and it is hoped that it provides a useful contribution to our understanding of this fascinating material.

Appendix 1. Descriptions of Forms Listed in Chapter 2

2.6.3 Non-blown Cups and Bowls

1. Cup with a double curved profile and low base ring, Fig.2.11.1 (Isings form 2, Price and Cottam 1998, 48-50). Cup or small bowl, occasionally found in polychrome glass, more common in monochrome colours, particularly dark green.
2. Bowl with double curved profile, flat base and low base ring, Fig.2.11.2. Shallow bowl with carination similar to the cup (no.3), but with a wider flat base and low base ring. Found in monochrome glass, very rare in polychrome.
3. Bowl with cylindrical side and flat base, Fig.2.11.3a and b (Isings form 22, Price and Cottam 1998, 50-51). Found in a range of sizes in monochrome glass. Small protruding ledge at join of lower body and base.
4. Convex bowl with no base ring, Fig.2.11.4 a and b (Isings forms 1 and 18). Produced in polychrome and monochrome glass and with deep and shallow profiles. Often has horizontal wheel-cutting on the inside surface, and occasionally the outside.
5. Small convex bowl with base ring Fig.2.11.5 (Isings form 20). Vertical or slightly out-turned rim. Produced in monochrome glass, often dark green.
6. Shallow bowl with a slightly convex body, flat base and low base ring, Fig.2.11.6 (Isings form 5). Produced in monochrome glass, often dark green.
7. Ribbed bowl (Isings form 3; Price and Cottam 1998, 44-46). Found in both polychrome and monochrome glass. Can be deep or shallow with pronounced ribs (Fig.2.11.7a), or shallow with short, closely set ribs (Fig.2.11.7b). Polished on inner surface, glossy outside surface below rim.
8. Scyphus, Fig.2.11.8 (Price and Cottam 1998, 51-53). Bowl with vertical rim, cylindrical or slightly convex body and two thin carved handles, often with carved decoration at sides of handle along rim edge. Produced in monochrome glass including colourless.
9. Plate/bowl with wide rim, often with overhanging edge Fig.2.11.9 (Price and Cottam 1998, 55-59). Sizes range from very small bowls, to wide plates. Wide rim, often with overhanging edge Straight or slightly convex body. Horizontal

base with base ring. Occasionally produced in polychrome glass, usually monochrome, often colourless. Sometimes facet cut, very occasionally has figurative decoration.

10. Shallow convex bowl without base ring Fig.2.11.10. Glossy exterior. Interior surface rough and only lightly polished.

2.6.4 Mould-blown Cups, Beakers and Bowls

1. Sports cup, Fig.2.11.11. Slightly curved cracked-off rim. Cylindrical or more rarely ovoid body, flat base. Moulded decoration depicting scenes from chariot races, gladitorial combat or occasionally boxing contests, in single or double zones. Names of contestents either in band around upper body below rim or more rarely within the main design. Monochrome, very occasionally polychrome.
2. Conical beaker with motifs, Fig.2.11.12 (Isings form 31) Curved cracked-off rim. Straight side with raised decoration including almond-shaped or circular bosses, geometric and vegetal motifs and mythological characters. Monochrome.
3. Cylindrical cup, Fig.2.11.13. Straight or slightly curved rim, edge cracked-off. Straight side with raised geometric design, sometime incorporating motto, usually in Greek. Monochrome.
4. Ovoid cup, Fig.2.11.14 Straight or curved rim, edge cracked off. Ovoid body with raised design, often ribs, occasionally geometric or vegetal motifs. Monochrome.
5. Ribbed bowl, Fig.2.11.15. Straight rim, edge cracked off. Convex body, small flat or slightly concave base. Body decorated with close-set vertical ribs. Raised circles on the base. Monochrome.

2.6.5 Blown Cups and Beakers

1. Wheel-cut cup, Fig.2.11.16 (Isings form 12). Convex or straight side upper body, sometimes with in-curved rim. Convex lower body, small flat or concave base. Invariably decorated with horizontal wheel-cutting and abraded lines, in single or grouped lines and grooves. Usually monochrome, occasionally polychrome including cased or painted cups.

2. Wheel-cut beaker on solid base, Fig.2.11.17 (Isings form 34). Curved, cracked-off rim, slightly convex body. Solid base with rounded base edge and central thickened dome. Body decorated with horizontal wheel-cut lines and grooves. Monochrome, usually blue/green.

3. Wheel-cut beaker with small tubular base Fig.2.11.18. Straight or curved rim, edge cracked off. Thin-walled slightly convex body, small narrow tubular base. Body decorated with horizontal wheel-cutting. Monochrome, usually pale green or blue/green.
4. Facet-cut or relief-cut beaker Fig.2.11.19. Tall or short conical or straight sided body. Base ring ground from the blown blank. Complex ground exterior surface decoration, often interlocking facets, but sometimes more intricate designs such as vine scrolls or shell motifs in high relief. Colourless.
5. Indented beaker, Fig.2.11.20 (Isings forms 32 and 34). Straight or curved cracked-off rim. Straight body with oval indents. Small concave base or tubular base ring. Colourless, greenish colourless or blue/green. (Fig.2.5.6).
6. Arcaded/trailed beaker, Fig.2.11.21. Straight or curved cracked-off rim. Straight side with vertical loops of applied trails sometimes joined at the bottom and pinched together to form diamond shapes. Small tubular base ring, concave base. Colourless, greenish colourless or blue/green.

2.6.6 Blown bowls

1. Small bowl with curved rim and pinched ribs, Fig.2.11.22 (Isings form 17). Curved rim, constriction above convex body, flat base. Body decorated with narrow vertical pinched ribs and sometimes a contrasting (usually opaque white) trail. Monochrome, or polychrome.

2. Tubular rim bowl, Fig.2.11.23a and b (Isings 1957 forms 44 and 45). Vertical or sometimes slightly out-turned rim, edge bent out and down to form. Convex or straight sided upper body. Horizontal lower body and base. Applied base ring or occasionally tubular base. Body can be deep or shallow. Monochrome, or very occasionally polychrome.

3. Convex bowl with rounded rim, Fig.2.11.24 (Isings form 42) Bowl with out-turned rounded rim, convex body and base ring, either applied or tubular. Monochrome, usually blue/green.

4. Cylindrical bowl with rounded rim, Fig.2.11.25 (Isings form 41). Bowl with vertical rounded rim, straight side and tubular base ring at junction of lower body and flat base. Monochrome, usually blue/green.

5. Conical bowl with rounded rim, Fig.2.11.26 (Isings form 43). Bowl with rounded rim, straight sides tapering in to base ring, either applied or tubular. Monochrome, usually blue/green.

6. Cantharus, Fig.2.11.27 (Isings 1957 forms 36, 38; van Lith 1991). Deep cup/bowl with stepped rim, straight upper body, convex lower body tapering into a short solid stem and separately blown foot. Usually has two high looped ribbon handles. Polychrome or monochrome.

7. Modiolus, Fig.2.11.28. (Isings form 37). Single handled vessel, often with stepped rim, either plain or tubular. Straight side tapering in. Tubular base ring, flat base. Very occasionally has ribbed decoration. Occasionally polychrome, usually monochrome

8. Scyphus Fig.2.11.29 (Isings form 39). Bowl with vertical or slightly out-turned rounded rim. Cylindrical or slightly convex body, usually with change of angle to horizontal lower body and base with applied base ring. Two handles, often with tooled ‘thumb-rest’ at the upper handle attachment and tooled projection at base of handle. Usually monochrome.

2.6.7 Jugs and Amphorisks

1. Conical jug, Fig.2.11.30 (Isings form 55). Horizontal folded rim, long neck, angular handle. Conical body expanding out. Flat base, or open pushed-in base

ring. Frequently decorated with ribs. Pinched extension trail sometimes below handle. Monochrome, occasionally polychrome.

2. Globular jug, fig 2.11.31 (Isings form 52b), Horizontal folded rim, long neck and angular handle. Convex body, open pushed-in base ring. Frequently decorated with ribs.

3. Short necked globular jug, Fig.2.11.32 (Isings form 57). Outurned rounded rim, constriction above convex body, flat base. Pinched trails sometimes present at handle attachments and along rim edge. Body sometimes ribbed. Monochrome, occasionally polychrome.

4. Biconical/ovoid jug, Fig.2.11.33 (Isings form 13). Folded rim, cylindrical neck expanding to wide, squat ovoid body, open base ring. Monochrome, occasionally monochrome.

5. Jug with spout, Fig.2.11.34 (Isings form 56). Rounded rim, wide mouth either pushed in on two sides or pulled out at a single point to form spout. Short neck, globular or ovoid body. Concave base, occasionally with base ring. Monochrome, occasionally polychrome.

6. Amphorisk, Fig.2.11.35 (Isings form 15). Folded rim, either horizontal or more often bent out and down to form a collar. Wide neck expanding out to ovoid body. Open pushed in base ring. Two curved ribbon handles. Pinched extension trail sometimes below handles. Monochrome, occasionally polychrome.

2.6.8 Jars

1. Jar with collar rim, Fig.2.11.36 (Isings form 67). Tubular rim bent out and down, ovoid or globular body and open pushed-in base ring. Sometimes decorated with ribs. Monochrome or very occasionally polychrome. (Fig.2.5.10).

2. Convex jar, Fig.2.11.37. Out-turned fire-rounded rim, constriction below rim, convex body, concave base. Blue/green.

3. Square jar, Fig.2.11.38 (Isings form 62). Tubular rim bent out and down. Shoulder above square body, flat base. Body and base often blown into a mould. Raised design often on underside of base, usually concentric circles. Blue/green.

4. Miniature jar, Fig.2.11.39 (Isings form 68). Out-turned rim, edge folded or rolled. Small (about 50mm high) ovoid body, flat base. Blue/green

2.6.9 Flasks and Unguent bottles

1. Ovoid flask, Fig.2.11.40 (Isings form 16). Folded rim, neck sometimes expanding out slightly, convex body, flat or slightly convave base. Occasionally decorated with horizontal wheel-cutting. Blue/green.
2. Bath flask, Fig.2.11.41 (Isings form 61). Folded rim, short neck, globular body. Often thick-walled. Two small looped handles at neck. Usually blue/green, very rarely polychrome,
3. Piriform/globular unguent bottles Fig.2.11.42 (Isings forms 6, 26, 28a). Grouped together as many do not fall clearly into defined forms. Rounded or rolled in rim. Short neck, globular or ovoid body, flat base. Monochrome, very occasionally polychrome.
4. Conical unguent bottle, Fig.2.11.43 (Isings form 28b). Slightly flared rim, edge rolled in or rounded. Cylindrical neck sometimes expanding out slightly. Short conical body, flat base. Blue/green.
5. Tubular unguent bottle, Fig.2.11.44 (Isings form 8 and 27). Slightly flared rim, edge rounded. Cylindrical neck. Slight constriction above tubular body, rounded base. Blue/green.
6. Spherical unguent bottle, Fig.2.11.45 (Isings form 10). Very small broken aperture, snapped off to access contents. Thin-walled globular body. Polychrome or monochrome.
7. Bird-shaped unguentaria, Fig.2.11.46 (Isings form 11). Sealed container with no aperture in the shape of a bird with a long tail. Tip of the tail usually broken to release contents. Monochrome.

2.6.10 Bottles

1. Square bottle, Fig.2.11.47 (Isings form 50). Folded rim, edge bent out, up and in. Short neck, horizontal or slightly sloping shoulder. Short angular handle, often decorated with very close-set ribs. Square body, flat base. Body and base usually blown into mould. Raised design usually present on underside of base, often concentric circles. Many sizes known. Blue/green.
2. Hexagonal bottle, Fig.2.11.48. Folded rim, edge bent out, up and in. Short neck, horizontal or slightly sloping shoulder. Short angular handle, often decorated with very close-set ribs. Hexagonal body, flat base. Body and base usually blown into a mould. Raised design usually present on underside of base, often concentric circles. Blue/green.
3. Cylindrical bottle, Fig.2.11.49 (Isings form 51). Folded rim, edge bent out, up and in. Short neck, horizontal or slightly sloping shoulder. Short angular handle, often decorated with very close-set ribs. Straight sided cylindrical body, flat or slightly concave base. Base undecorated. Blue/green.

Appendix 2. Glassworking evidence from assemblages in Chapter 4 and other 1st century A.D. sites

1. Evidence from sites included in Chapter 4

Whilst no furnace structures were associated with the assemblages reviewed in chapter 4, there was evidence of glass working waste at three or possibly four sites.

1.1 London, Plantation Place

Five fragments from 1st or early 2nd century contexts (c.A.D.85-120/30) could be identified with certainty as glassworking waste and a further three fragments had features that might relate to glassworking. All were blue green. The type of vessels being produced is not known, although they were clearly blown, as indicated by the presence of moils, which come from the end of the blowing iron (Fig.1)

Fig.1 moil from Plantation Place period 4 (late 1st-early 2nd century A.D.)

1.2 Camelon

Firm evidence of glassworking at Camelon came with the discovery of two or three tubular moil fragments, two of which came from a Flavian pit, along with some very bubbly and distorted pieces that might also represent glassworking waste. There were also a number of rather poorly produced blown cups with fire rounded rims, which showed signs of inadequate annealing, perhaps indicative of local manufacture. Two of these came from Flavian contexts (Fig.2). All these fragments were blue/green.

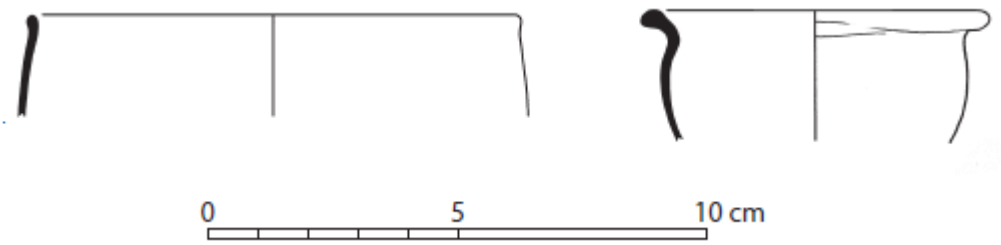


Fig.2 Possible local products from Camelon (drawing courtesy V.Maxfield)

1.3 Nijmegen

There is persuasive evidence for glassworking in the settlements surrounding the legionary fortress of Nijmegen, though no furnaces, crucibles or tools have been found. In the eastern *canabae* a number of pits containing thousands of glass fragments were examined (see Chapter 4.8.1). The quantity of glass found in the excavated pits has been interpreted as evidence of the collection of fragments for recycling (Isings 1980, 281). Amongst this material were many pieces which could be related to vessel production. What was described as ‘a large quantity of neck-fragments’ were identified as possible wasters on the basis of the impurities contained in the glass. Alongside these were two cylindrical fragments in blue/green streaky glass, both with internal ledges. These are described as necks, but they certainly deserve closer inspection in view of the resemblance of the illustrations to cylindrical moils (Isings 1980, 307 nos.339-340 Fig.16 nos.12 and 13). There were also melted and twisted pieces, described as ‘nipped off ends of handles’ some of which were in good quality colourless glass (Isings 1980, 324-325, Fig.30 nos.7-14).

Another group of blue/green and greenish fragments with streaks and bubbles may also relate to glassworking. Described as ‘tackle-heads’ or ‘handle terminals’, these short rods with one flattened end may relate to waste glass attached to the tip of the blowing iron which is flattened whilst still hot by the glassworker before being knocked away and discarded (Isings 1980, 291, 323 nos.935-950, Fig.28 nos.13-15, Fig.29 nos.1-9). Whilst not noted in the 1980 report as locally produced vessels, the fact that blue/green cups, bowls and jars with fire-rounded rims were found in such huge numbers in the pits in the eastern *canabae* raises questions as to their provenance. Cups and bowls with fire-rounded rims do occur on some contemporary sites (as at Camelon and Barzan for

example), but they are not found elsewhere in such high numbers as they are at Nijmegen where they are the most common single vessel form (Isings 1980, 282 Fig.1). Finds from the western *canabae* have also prompted discussion of the possibility of local production (van Lith 1996). Excavations between 1987 and 1995 produced fragments with the sort of poor production values (such as streaks and bubbles) often associated with local manufacture, on the assumption that poor quality vessels are unlikely to be traded over long distances. Several mould-blown vessels were highlighted by van Lith as possible local products including cups with inscriptions, despite these being in Greek. The possibility of a trade in moulds rather than the vessels themselves was put forward (van Lith 1996, 133). In general therefore, the evidence for glassmaking in the western *canabae* remains sketchy for the moment, but the presence of furnaces in the eastern area seems highly likely.

1.4 Waddon Hill

There is some slight evidence for possible glassmaking activity at the fort of Waddon Hill. A single blue/green fragment with numerous bubbly and dark streaks has features similar to some moil fragments (Fig.7.3 left). The piece is not dated, though it can be assumed to be of a similar mid-1st century date to the rest of the glass assemblage. If supporting evidence were to come to light, then it would be amongst the earliest glass vessel-making in Roman Britain.

Fig.7.3 Possible moil fragment (left), Waddon Hill

2. Other glass production sites in the western provinces in the 1st century A.D.

2.1 Avenches

The furnaces at Avenches (Aventicum) in eastern Switzerland were studied in depth as part of a doctoral thesis by Heidi Amrein (Amrein 2001). Five furnaces were uncovered during excavation, of which only the base sections survived to a depth of about 20cm below the Roman ground level. Along with the furnaces there was a considerable amount of glass waste including several types of moil, fragments with tooling marks, droplets and twists of melted glass, thin glass batons, chips of raw glass, and the remains of several vessel forms thought to have been produced at the site. This wealth of evidence provides some of the best information available concerning 1st century glass making.

Glassworkers were active here between c.A.D.40 and 70, though it is unclear how long the furnaces were being used. It is unlikely that they were all in operation throughout this period, given that only one of the extant furnaces can be demonstrated to have been disused and a later furnace built in its place. Indeed, it is possible that the timespan was no longer than a season or two, as the vessel forms found in association with the workshop could all have been in contemporary production.

The furnaces were situated in an artisan quarter approximately 500m from the centre of the town, and their demise is thought to be connected to the expansion of the urban street network (Amrein 2001 12-13 Fig.2). Little is known of the superstructure surrounding the furnaces, but there appears to have been some sort of walled enclosure and perhaps a roof. The furnaces were circular, built of tiles and clay and between 50cm and 65cm in diameter. Four were close together, with a fifth a little further apart and on a higher terrace. It is possible that three of the furnaces were in contemporary use, with one these being ultimately replaced by a fourth on a slightly different footprint. No metal or wooden tools were recognised. Near the furnaces was a dump of ash containing many thousands of fragments of glass. Chips of raw glass in six transparent colours were found:- blue/green, dark green, dark blue, yellow/brown, purple and ‘turquoise’ as well as three opaque colours:- pale blue darker blue and white (Amrein 2001, 18 Fig.9). Glass blowing was demonstrated by the presence of more than 5,000 moils, all of which

were cylindrical. Glass waste came principally from monochrome vessels, but some polychrome fragments were found. Fragments of vessels with a thin interior surface of lead, such as are known on some spherical flasks of Isings form 10, were also found. A deposit of lead near the furnaces indicates that the process of coating the vessels was performed at the glassworking site. Other decorated vessels that appear to have been manufactured at the site include polychrome vessels with opaque splashes and blobs and trailed vessels. Several forms were identified as probably being manufactured locally on the basis of the quantity of recovered fragments and the association with waste material (Amrein 2001, 76 Fig.80). Several unguent bottle forms were noted, including bird-shaped unguent flasks (Isings form 11), small globular or ovoid unguent bottles comparable with Isings forms 6 and 28, tubular unguent bottles of Isings form 8 and spherical unguent bottles of Isings form 10. Other probably local blown forms were amphorisks (Isings form 15) and funnels (Isings form 76). Some mould-blown unguent flasks in the shape of pine cones or grape bunches were also thought to have been made locally, though no moulds were found. Other forms possibly produced at Avenches include convex jugs and jars.

2.2 Lyon

There is a wealth of evidence for glassworking in Lyon throughout the Roman period. This includes the discovery of raw glass, furnaces, waste debris and moulds as well as the presence of the tombstone of the 3rd century A.D. glassworker Julius Alexsander (Price 2005a, 176 Fig.10.9). A study of the glassworkers of Lyon formed a major part of the recent PhD thesis of Laudine Robin, and the summary here derives from that work and from published work by both Robin and others (Robin 2012b, Robin 2012c; Foy and Nenna 2001, 42, 47-50, 52-3).

The best evidence for 1st century glassworking comes from a group of sites clustered around the Quai Saint-Vincent on the northern bank of the Saône opposite the heart of the city. Two areas were particularly rich in remains, La Montée de la Butte and the Manutention Militaire site, both dated to the 1st century. At these two sites there was enough material for Robin to identify with confidence specific forms as local products. At La Montée de la Butte, excavated in 2001, there were 16 furnaces and 2 burnt areas, possibly marking further furnaces. There were indications that other furnaces lay just

outside the excavated area. All were circular, and generally between 40-60cm in diameter. They were made from brick and tile, usually with stone floors in the firing chamber. Their construction was not always uniform, and recycled material, including a millstone was also incorporated. One furnace appeared to have an annealing oven attached. No crucibles were found either here or at other furnace sites in Lyon. The period of use has been placed between c.A.D.40-c.A.D.70.

The furnaces were constructed in close proximity to contemporary pottery workshops producing local wares. Parts of a mould to produce square bottles were found close to one of the pottery workshops. However, no waste from bottle-making came from the glass furnace sites, prompting the suggestion that there might have been a specialised bottle-making workshop beyond the boundary of the excavation.

Three large dumps of waste material including charcoal, furnace debris, waste glass and raw glass were associated with the furnaces. In one, 21kg of waste glass was found. Raw glass chips were present in a range of colours. Of these 55% were strongly coloured with dark blue, purple yellow/brown and dark green being the most common strong colours. There was also a large group of moils in a similar range of colours. All were cylindrical moils.

The colours represented by both the raw glass and glass waste are very diverse. Alongside the natural blue/green and pale greenish colours are all the main strong colours as well as opaque white and blue. There is evidence that polychrome glass was also being produced. The site is remarkable for the high percentage of purple glass amongst the waste debris (Robin 2012b, 54-5 Fig.29). It forms 18.5% of the raw glass chips, a higher proportion than both dark blue and dark green, and 5.2% of the waste glass, slightly less than dark blue and yellow/brown, but a much higher percentage than dark green. Purple glass is usually the least common of the major strong colours by a considerable margin. At the Rue Bourgelat site in Lyon (Chapter 4.2.3) for example, purple was very poorly represented, with dark blue and dark green much more popular. Several vessel forms were identified as the products of these workshops on the evidence of the glass waste and the equipment found. The tablewares identified with confidence as local products were non-blown ribbed bowls, both monochrome and polychrome (Isings form 3), wheel-cut cups (Isings form 12), a few of which are polychrome,

wheel-cut beakers (Isings form 34), small blown ribbed bowls (Isings form 17) tubular rimmed bowls (Isings form 44 and 45), amphorisks (Isings form 15) and ovoid and globular jugs. The unguentaria identified were tubular (Isings form 8), small ovoid and piriform (comparable to Isings form 6), globular (Isings form 10), bird-shaped (Isings form 11) and ovoid with a pointed base (Isings form 9). Twisted rods also seem to have produced here. The production of unguentaria was seen as the main focus of production in the workshop, with over 2000 fragments recorded. As at Avenches, the forms included two which were sealed by heat, the bird-shaped and globular unguentaria.
A little further east along the bank of the Saône excavations in the courtyard of the Manutention Militaire uncovered traces of glassworking activity dated to the same period as the La Montée de la Butte workshops. Again, the site was also occupied by potters. The evidence for glassworking came from a large dump of waste material. The range of colours present was comparable with La Montée de la Butte and included strong colours and polychrome fragments. Non-blown ribbed bowls, tubular, globular and small ovoid unguentaria, amphorisks and jugs were the forms identified with confidence as being produced at the workshop.

Elsewhere, evidence for a large square or rectangular furnace came from La Place de la Butte. The function of this furnace was unclear, but it was suggested that it might have been used for re-melting recycled fragments (Robin 2012b, 36-7). One of the pieces had been in contact with dark blue glass, suggesting 1st century activity.

2.3 Reims

A glass workshop was operating in the south west part of the city of Reims in the second half of the 1st century (Cabart 2003). During excavations in an area where other industries were located, a kilogramme of glass was recovered, including chips of raw glass in blue/green and strong colours, melted drops, pulled-out trails and twists, moils and other items of glassworking waste. No furnace was found. Fragments from about 100 globular flasks were also identified. These were considered to have produced in Reims. There was also evidence for the production of vessels with polychrome trails, blobs and enamelling. Other fragments from a wide range of vessels may have been brought to the site from recycling.

2.4 Saintes

Three or four workshops have been proposed as operating in Saintes in the late 1st century, of which the best preserved and published is at the Rue Renaud-Rousseau site (Hochuli-Gysel 2003, 184-191). Debris from a glass workshop, alongside ceramics and a stamped lamp, was found discarded in a deep well. Parts of one or more furnaces were identified, along with fragments of crucibles. There were 35kg of melted glass, moils and discarded glass pieces, seven stone moulds for the production of square bottles and an iron tool. Cylindrical and lid-moils suggest that both closed and open vessels were being produced (Hochuli-Gysel 2003, 190 Fig.15). A cracked and uneven bottle base decorated with concentric circles and found amongst the glass waste matches one of the stone mould bases. The use of a pontil to hold the vessel by the base during manufacture is demonstrated by scars on some of the discarded pieces.

The glass was predominantly blue/green and yellow/green, though there were a few fragments of what are described as being 'de couleur apparement plus anciens que la production de l'atelier' – presumably strongly coloured pieces. Recycling of glass was suggested as a reason for their presence.

This deposit provides persuasive evidence for the types of vessel being produced. The discovery of bottle moulds and matching fragments leaves little doubt that square bottles were being made here. Other forms present amongst the waste were conical beakers with small tubular bases decorated with looped trails (comparable to Isings form 33), bowls with an out-turned rim decorated with a pinched trail (Isings form 43) and small flasks (Hochuli-Gysel 1993, 86 Fig.7 nos.1-7; Hochuli-Gysel 2003, 191 Fig.18).

Saintes is an important site in terms of the quality and diversity of the remains, which include glass debris, moulds and tools and furnace remains. However, the location of the furnace or furnaces is still unknown.

2.5 London

Evidence for early glassworking has been uncovered at several locations in London. The presence of glass moils was noted above at Plantation Place, suggesting some

nearby glassworking activity. A summary of glassworking sites has recently been brought together in a gazeteer (Shepherd 2015), and this along with relevant site reports cited below forms the basis of the information presented here.

Glassworking is present in pre-Boudiccan London where distorted bead fragments were recovered from a roundhouse on the western edges of the city. This is described as being likely to have involved native beadmakers rather than incoming workers. Vessel manufacture is first attested at the Regis House site on the north bank of the Thames. A small furnace was uncovered in a warehouse/workshop 4 metres north of the quayside, along with glassworking waste. Small bottles and drinking vessels are described as the probable products, along with twisted rods. A large group of fragments may have been cullet, and one lump of dark blue raw glass was also noted (Brigham, Watson, Tyers and Bartkowiak 2008, 38). Wood from the construction of the quay was dated to A.D.63, and activity at the workshop is thought to have ended by A.D.70.

Excavations in the 1950s at Watling House, west of the Walbrook stream uncovered a pit with Neronian/early Flavian ceramics and glassworking waste (Shepherd 1986, 141-143). The presence of fragments of burnt clay, probably from a glass furnace, suggests that the workshop was nearby. The 14 fragments of glassworking waste included lid moils, indicating that open vessels were produced there, and cylindrical moils, one of which was so narrow that it was interpreted as belonging to a very narrow-necked vessel, perhaps an unguent bottle. Nearly 100 vessel fragments were also found, which were thought to be cullet. The only firmly recognisable forms in this collection were bottles. All the glass from the pit was blue/green. A collection of glass fragments, also thought to have been together as cullet and dated to A.D.50-100/120, was discovered at Bow Bells House in the west of the Roman city (Wardle 2013).

At the Bucklersbury House site, alongside the Walbrook stream, a small deposit of glassworking waste was found in levels dating to the later 1st century A.D. The group including lid moils, all blue/green and a collection of vessel fragments believed to be cullet (Shepherd 2015, 37-38 Fig.3.4).

2.6 Cologne

Glassworking has been identified at several sites within and on the outskirts of the city. The earliest identified workshop was discovered on the site of the Praetorium, and has been dated to the second quarter of the 1st century A.D. on the basis of its relationship with the subsequent structure (Höpken and Schäfer 2006, 74-77). Three small circular furnaces were found, constructed of brick and tile. No associated vessel fragments were identified but the presence of melted greenish glass was interpreted as an indication that natural blue/green vessels were produced at the workshop. Another early workshop was identified to the north of the city by the road leading to Neuss (Eigelsteinstrasse) during excavations in the 1920s. This site, Eigelstein 14, had five or six rectangular and small circular furnaces built from tiles and clay (Follmann-Schulz 1991, 35-6; Höpken and Schäfer 2006, 77). The floor and walls of the furnaces were covered in melted glass. Three or four periods of activity were identified, pre-Claudian, Claudian, and Flavian or later. Glass vessels found in the vicinity of the furnaces included non-blown ribbed bowls (Isings form 3) collar-rim globular jars, mould-blown square jars and square bottles and small flasks/unguent bottles (comparable to Isings form 28). A further workshop, Eigelstein 35-37, previously described as 1st century (Doppelfeld 1966, 14; Follmann-Schulz 1991, 36) has been re-dated to the later 2nd century (Höpken and Schäfer 2006, 78 [9]).

2.7 Early Italian glassmaking sites

It is perhaps surprising that there are so few firmly identified sites relating to glass vessel production during the 1st century A.D. in Italy, despite the weight of circumstantial evidence that points to the region as an active centre of production at this time. Several 1st century authors refer to glassmaking in Italy. As we have seen, Strabo mentions glassworking in Rome, Pliny the Elder discusses sand quality in Campania, and Martial uses the analogy of glass cullet-collectors by the Tiber to mock Caecilius in his Epigram I, XLI.

[9] Further details on the re-dating of this workshop on the basis of associated 2nd century ceramics were provided by Constanze Höpken in a recent presentation, 'The glass workshops in Cologne with a special focus on Eigelstein 35-37'. Presentation to the conference "Roman glass furnaces contexts, finds and reconstructions in synthesis" 11th-12th June 2016, Villa Borg, Perl, Germany.

Extant evidence pointing to glass vessel production in the 1st century A.D. comes from a very limited number of sites. At Aquileia there is a small group of melted fragments, twists and drops as well as two pieces from crucibles. These items have lost their documentation and it is not possible to know where in Aquileia they were found (Calvi, Tornati and Scandellari 1963; Calvi 1969, 11-12, tav.30-31). They are also undated, though the fact that some appear to be strongly coloured may point to a first century date. Certain forms of small flasks also seem to be particularly numerous in Aquileia and the surrounding region, pointing to a nearby production centre. These include small blown flasks with a distinctive shoulder and a carinated body (Isings 1957 form 7; Calvi 1969, tav.3 nos.3-4). The few examples known from dated contexts suggest that these flasks were in production by the mid-1st century A.D. (Calvi, Tornati and Scandellari 1963, 320-1, Fig.6).

Other areas of northern Italy have also been cited as the possible origin of specific 1st century forms, usually taking the high concentration of with which occur in regional burials as an indicator of possible local production. These include the blown ribbed bowls of Isings form 17 (Haevernick 1967) as well as several forms of beaker, unguent flask, jugs and bottles (Biaggio Simona 1991, 284-289).

Elsewhere, raw glass has been noted in *insula* 17 at Pompeii, though the exact findspot is uncertain. Its presence does however suggest glassworking in the town (De Francesco et al. 2010, 12 Fig.1 d).

2.8 Early glassmaking sites in Spain and Portugal

Although no Spanish and Portuguese assemblages are specifically covered in this study, it is worth considering some of the early glass workshops that have been identified. A useful gazetteer by Mário da Cruz and Maria Dolores Sánchez de Prado notes at least eight glassworking sites that can be dated with certainty to the 1st century A.D. or may have seen some 1st century activity (da Cruz and Sánchez de Prado 2015). Most of the examples are situated in major cities, but in two cases, Los Barrios at Vente del Carmen near Gibraltar and 'El Alfar de la Maja' near Calahorra in the Rioja region, glassworking appears to be associated with major pottery industries. In the first example the workshop, which can be dated to c.A.D.80 onwards, may have been producing unguentaria. At the second of these sites, metal tools including a blowing iron indicate

that blown vessels were being made. Elsewhere there is very little further information concerning the types of vessels being made, although a mould for a prismatic bottle came from an artisan quarter near the city walls of Augustobriga (Cáceres) in a context dated to the late 1st or early 2nd century.

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